FORT HOOD
JOINT LAND USE STUDY

December 2016

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Prepared for
City of Killeen, JLUS Sponsor

Study Partners
City of Copperas Cove • City Gatesville
City of Harker Heights • City of Temple • City of Belton
City of Nolanville • City of Brownwood
Bell County • Coryell County

Prepared by
Benchmark Planning

In association with
White & Smith, LLC
Marstel-Day, LLC

POLICY COMMITTEE ENDORSEMENT

RESOLUTION OF ENDORSEMENT
FORT HOOD JOINT LAND USE STUDY

WHEREAS, the Fort Hood Joint Land Use Study Policy Committee was formed by the local, regional, state, and federal entities participating in the study; and

WHEREAS, the members of the Policy Committee were appointed by their respective organizations to lead the study; and

WHEREAS, the Policy Committee has guided the preparation of the Joint Land Use Study with the assistance of a Technical Committee comprised of subject matter experts from the associated local governments and other participating organizations; and

WHEREAS, the Policy Committee has reviewed the study and concurs with the findings and recommendations of the Joint Land Use Study; and

WHEREAS, the Policy Committee supports the implementation of the study's recommendations in support of sustaining the training, operational and testing mission of Fort Hood.

NOW, THEREFORE, BE IT RESOLVED, that the Fort Hood Joint Land Use Study Policy Committee hereby endorses the final study and recommends its acceptance by the project sponsor.

Adopted this the 30th day of November, 2016 by motion of the assembled committee.

Jose L. Segarra, Mayor, City of Killeen

ACKNOWLEDGMENTS

POLICY COMMITTEE

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Jose Segarra, Mayor	City of Killeen
James Kilpatrick, Councilman	City of Killeen City Council
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John E. Firth, County Judge	Coryell County

This study was prepared under contract with the City of Killeen, Texas with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the study partners involved in the development of this study, including the cities of Killeen, Copperas Cove, Gatesville, Harker Heights, Temple, Belton, Nolanville and Brownwood and the counties of Bell and Coryell, and does not necessarily reflect the views of the Office of Economic Adjustment.

ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

At the present time, encroachment from civilian land use and development patterns is not impacting or limiting Fort Hood's operational, testing, training and power projection missions. The missions are intact today and for the immediate future. The region has the opportunity to be proactive in working together to mitigate future incompatible conditions and promote the long-term sustainability of Fort Hood's mission.

STUDY PURPOSE

The overarching purpose of the Fort Hood JLUS was to identify ways that Fort Hood and the neighboring civilian communities could work together cooperatively to encourage compatible growth and help to ensure the long term viability and sustainability of Fort Hood's mission. While many important goals and objectives were established as part of this process, the primary guiding goals were to:

- Identify and mitigate compatibility and encroachment issues that may impact training, operations, testing and power projection missions at Fort Hood;
- Enhance regional collaboration between local governments and Fort Hood; and
- Inform the update to the City of Killeen Strategic Plan - Vision 2030 v2.0.

STUDY ORGANIZATION

The study is organized into six sections as follows:

- Section One - Introduction
- Section Two - Regional Profile
- Section Three - Fort Hood Profile
- Section Four - Land Use Compatibility Assessment
- Section Five - Compatibility Tools
- Section Six - Recommendations

SECTION ONE - INTRODUCTION

The plan begins with an overview of the study process and meeting dates, the study area and public engagement activities. The JLUS process began in October 2015 and concluded in December 2016.

SECTION TWO - REGIONAL PROFILE

This section of the plan includes important factors across the region that influence growth and development. This section contains a demographic, economic and housing profile, along with an analysis of the regional development patterns and a review of key environmental features such as water, air and alternative energy.

SECTION THREE - FORT HOOD PROFILE

It was important to establish a firm understanding of the operational, testing and training mission at Fort Hood as part of the Joint Land Use Study. This section provides an overview and brief history of the installation followed by a detailed look at the Fort Hood mission footprint. The areas of focus concerning the mission footprint in this study included ground operations (maneuvering and weapons training) and aviation operations, which focused on the airfields, aircraft accident potential and aviation noise.

SECTION FOUR - LAND USE COMPATIBILITY

The land use compatibility section examines how the region's growth and the operational, testing and training activities at Fort Hood interface around the perimeter of the installation. The section identifies the degree of land use compatibility across the region between civilian development and the military operational, testing and training mission.

SECTION FIVE - COMPATIBILITY TOOLS

Military communities across the country have implemented a variety of tools to encourage land use compatibility. This section highlights the compatible land use tools that are available at the Federal, State, Regional and Local level in the Fort Hood region.

SECTION SIX - RECOMMENDATIONS

This section of the report identifies recommendations that the study partners should consider for adoption in their community to implement the goals of the Joint Land Use Study. In addition, implementation strategies with both regional and community-specific actions were developed as a means to provide direct guidance on how the recommendations can be implemented by the study partners.

STUDY RECOMMENDATIONS

At Fort Hood, the current operational, testing and training missions are intact today and for the immediate future. The study partners and Fort Hood have the opportunity to continue working together to address any future changes in the military's mission and growth in the surrounding communities in order to mitigate any potentially unfavorable conditions in the future that could negatively impact the long-term operational, testing and training mission at Fort Hood.

A range of recommendations was developed for consideration by the region and are detailed in the recommendations section of this study. The recommendations were organized into four categories as outlined below.

- Regional coordination in support of compatible growth
- Planning for compatible growth
- Regulations to support compatible growth strategies
- Supplemental strategies

REGIONAL COORDINATION IN SUPPORT OF COMPATIBLE GROWTH

The communities in the Fort Hood region have maintained strong relationships between each other and with Fort Hood. The Joint Land Use Study process has identified a need for these ongoing relationships to be strengthened with a more formalized framework to facilitate focused communication between local governments and Fort Hood on encroachment issues, regional development patterns, future land use and other related matters. At the big picture, policy level, the region communicates well and has been successful in responding to situations that warrant regional coordination and cooperation, such as past BRAC rounds. However, at the technical level and community level, many of those connections and lines of communication may benefit from a more defined and formalized structure. An official framework would provide for clear communication throughout the region from a policy, technical and community standpoint, providing for greater support and ability to effectively sustain the operational, testing and training mission at Fort Hood. A formalized framework for regional cooperation would also serve as the venue for implementing the full set of strategies recommended by the JLUS across jurisdictional boundaries in a coordinated manner.

PLANNING FOR COMPATIBLE GROWTH

At the local and regional level, the opportunity exists to adopt plans and policies to help protect the Fort Hood operational, testing and training mission, by encouraging civilian development patterns adjacent to the installation that are compatible. The recommendations for this area provide policy guidance to the local governments for their consideration.

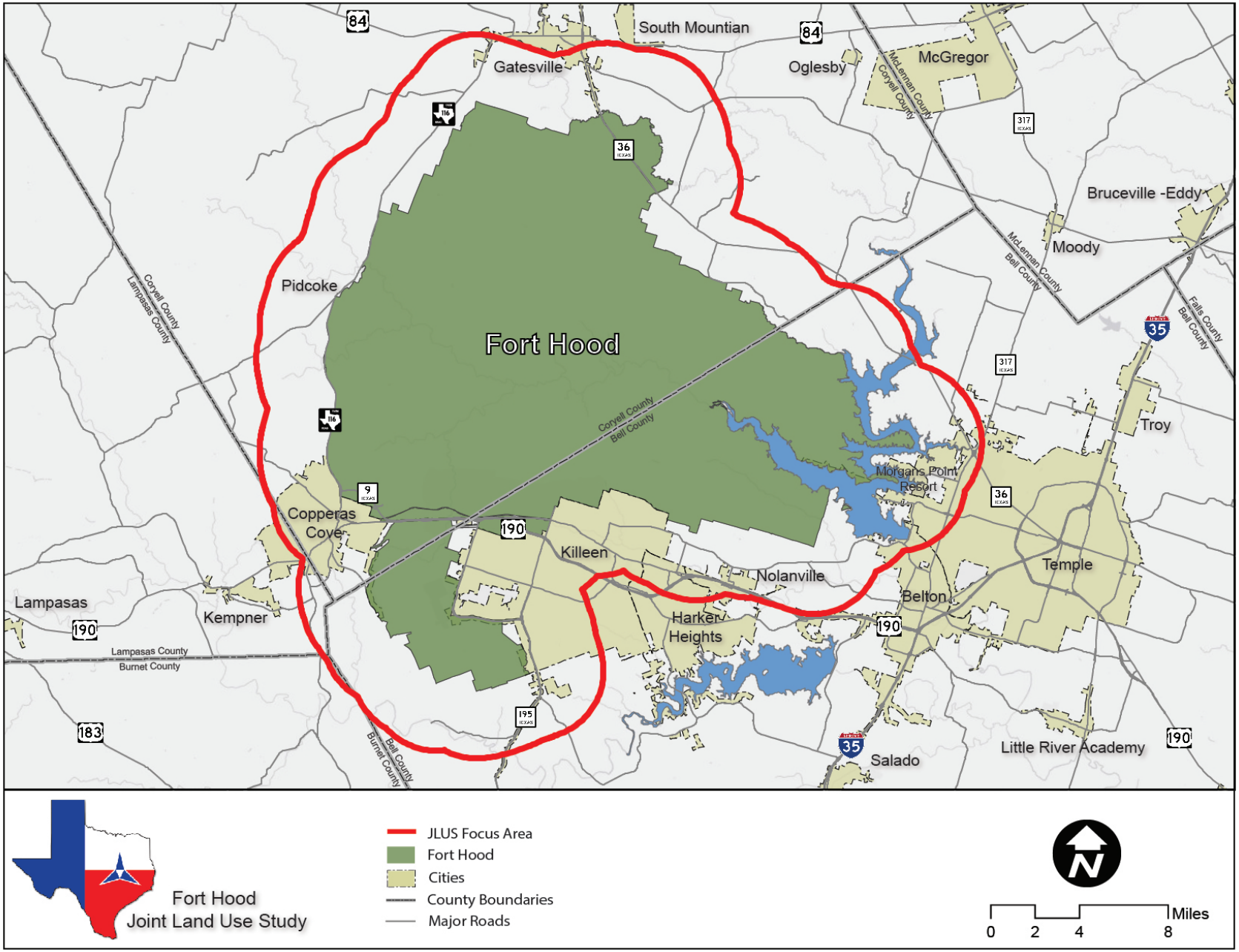
REGULATIONS TO SUPPORT COMPATIBLE GROWTH STRATEGIES

The Joint Land Use Study identified existing and potential regulatory tools to help implement the goals of the study. The recommendations for this category provide an array of options and potential tools that are available or may become available in the future for local government consideration.

SUPPLEMENTAL STRATEGIES

While land use compatibility was the focus of the Joint Land Use Study, other related factors exist that contribute to the growth of the region and influence the future of the region's communities and the sustainability of Fort Hood. For this area, supplemental recommendations provide guidance on topics that arose during the course of the JLUS process which can help to further regional compatible growth objectives, but which may not fit neatly into the framework of the preceding categories.

▼ JLUS FOCUS AREA



INTRODUCTION
SECTION ONE

INTRODUCTION

The Fort Hood Joint Land Use Study identifies ways that the region and Fort Hood can work together cooperatively to encourage compatible growth, helping to ensure the long term viability and sustainability of Fort Hood's operational, testing and training mission.

1.1 STUDY PURPOSE

As communities surrounding military installations experience population growth and urban development, the military's ability to maintain its testing, training and operational missions can be impacted. In an effort to encourage military installations and communities to plan for the future collaboratively, the U.S. Department of Defense created the Joint Land Use Study program, which is administered by the Office of Economic Adjustment. The JLUS process brings together business leaders, citizens, local, state and federal officials, property owners, military officials and others to identify opportunities for growth that is compatible, helping to preserve the military's ability to test and train and the community's ability to expand its economic opportunities.

Although a Joint Land Use Study is primarily funded by the Office of Economic Adjustment, the communities that receive JLUS funding are responsible for developing and implementing the JLUS. The City of Killeen served as region's sponsor for the Fort Hood JLUS with strong local government support from across the region and active participation from Fort Hood.

The study partners included the cities of Killeen, Copperas Cove, Gatesville, Harker Heights, Temple, Belton, Nolanville and Brownwood and the counties of Bell and Coryell.

The overarching purpose of the Fort Hood JLUS was to identify ways that Fort Hood and the neighboring civilian communities could work together cooperatively to encourage compatible growth and help to ensure the long term viability and sustainability of Fort Hood's mission. While many important goals and objectives were established as part of this process, the primary guiding goals were to:

- Identify and mitigate compatibility and encroachment issues that may impact training, operations, testing and power projection missions at Fort Hood;
- Enhance regional collaboration between local governments and Fort Hood; and
- Inform the update to the City of Killeen Strategic Plan - Vision 2030 v2.0.

1.2 STUDY PROCESS

With the City of Killeen serving as the study sponsor, representatives from the region's cities and counties were appointed to participate on two committees: a Policy Committee and a Technical Committee. The Policy Committee primarily included elected officials who were given the charge to guide the overall direction of the process and to approve the final report. The Technical Committee, which consisted of city managers, and planners, Fort Hood staff, and representatives from local and regional organizations, was formed to help guide the consultant's work on the project. The meeting dates and milestones from the Joint Land Use Study Process are highlighted in Table 1.1.

▼ TABLE 1.1 MEETING DATES & PROJECT MILESTONES

2015 Meeting Dates & Project Milestones	
October	• Project Initiation • HOTDA Briefing • Killeen City Council Briefing
November	• Policy Committee Kick-off Meeting • Technical Committee Kick-off Meeting • Fort Hood Installation Tour
December	• Stakeholder/Focus Group Interviews • Technical Committee Meeting • Public Kick-off Meeting

▼ IMAGE 1.1 DECEMBER 2015 TECHNICAL COMMITTEE MEETING

▼ IMAGE 1.2 APRIL 2016 TECHNICAL COMMITTEE MEETING

▼ TABLE 1.1 MEETING DATES & PROJECT MILESTONES (CONTINUED)

2016 Meeting Dates & Project Milestones	
January	• Policy Committee Meeting • Technical Committee Meeting • HOTDA Briefing • Stakeholder/Focus Group Interviews • Data Collection and Mapping
February	• Stakeholder/Focus Group Interviews • Data Collection and Mapping
March	• Policy Committee review of Data Collection & Mapping • Technical Committee review of Data Collection & Mapping
April	• Policy Committee review of Land Use Analysis & Policy • Technical Committee review of Land Use Analysis & Policy
May	• Policy Committee review of Future Land use Compatibility • Technical Committee review Future Land use Compatibility
June	• Policy Committee review of Compatibility Tools and Policies • Technical Committee review of Compatibility Tools and Policies
July	• Draft Joint Land Use Study Preparation
August	• Technical Committee review of Draft JLUS
September	• Policy Committee review of Draft JLUS
October	• Public Input Meeting on Draft JLUS • Technical Committee discussion of JLUS Implementation
November	• Policy Committee Meeting to consider Final JLUS Report
December	• Killeen City Council Briefing on final JLUS report

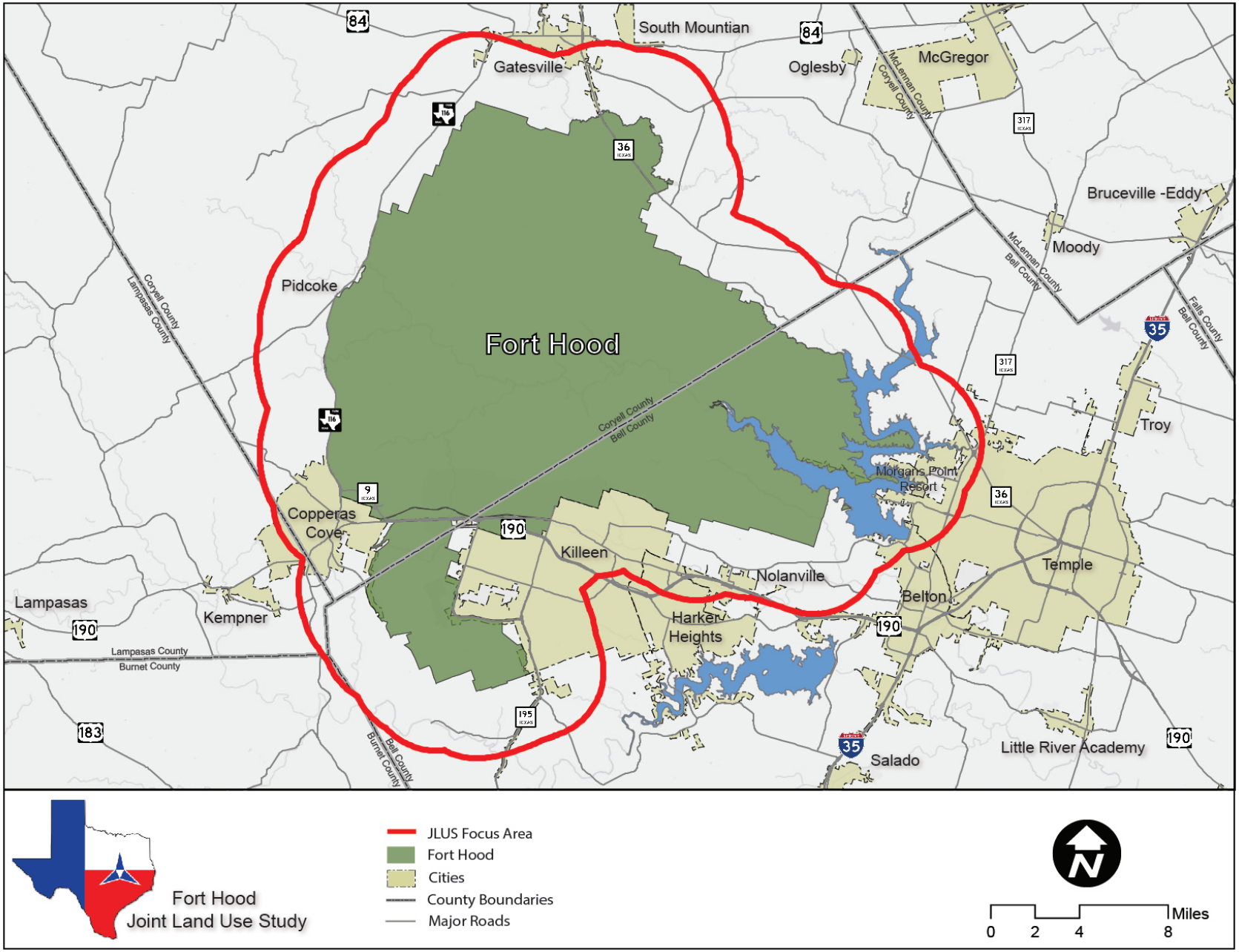
1.3 JLUS FOCUS AREA

The primary study area included Fort Hood and the counties and cities immediately adjacent to the installation. The primary study area expands 3 miles from the outer boundary of the 217,000 acre installation. A map of the primary study area is displayed in Map 1.1 and a map showing the area's relationship to the much larger Western Training Area is depicted in Map 1.2. The expansive Western Training Area extends northwest to Brownwood, due west to San Angelo, and southwest to Fredericksburg encompassing approximately 8,200 square miles. The primary study area provided the focus for the majority of the study's analysis and recommendations, with the Western Training Area receiving less attention due to its lower population densities and lower concentration of military training activities.

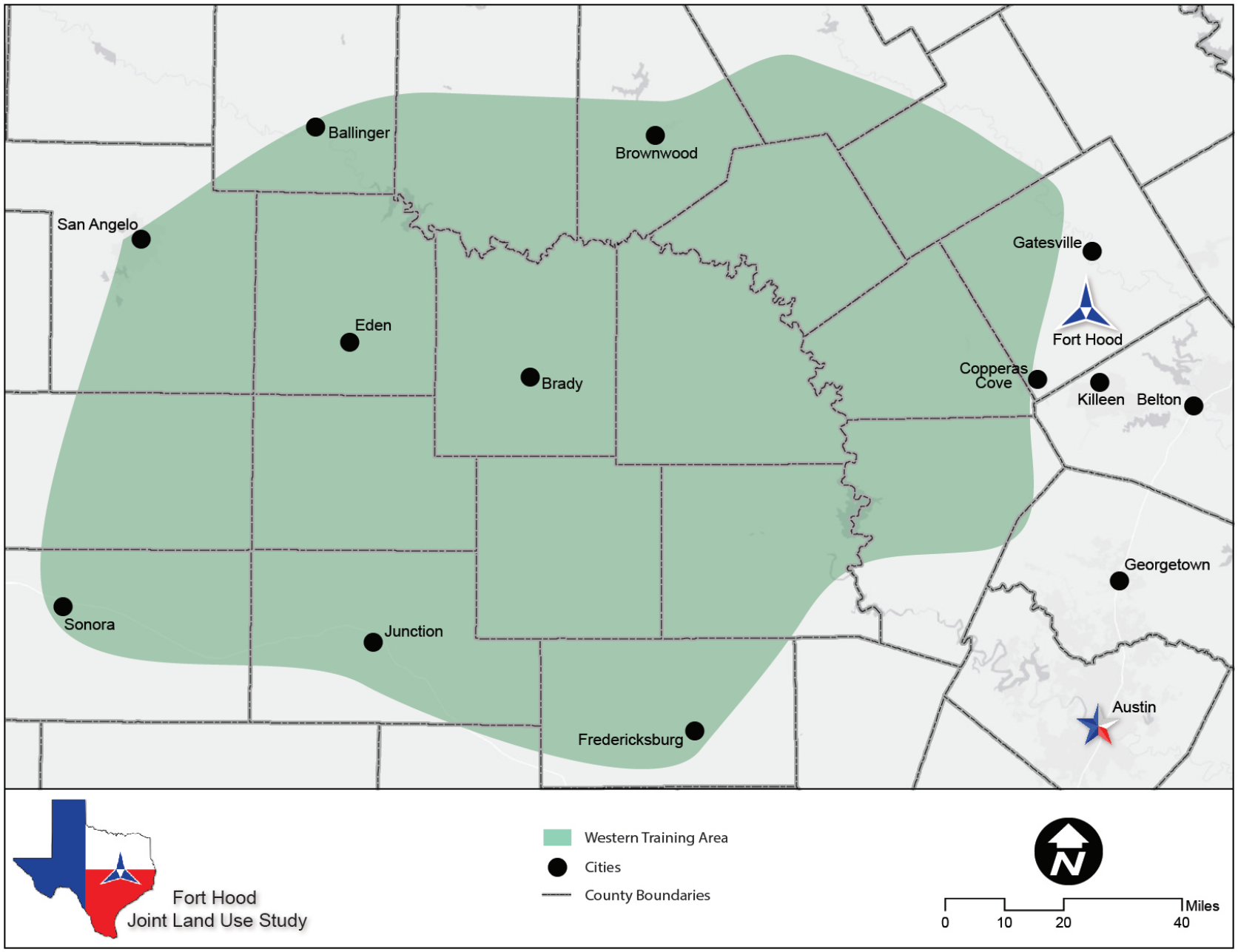
1.4 PUBLIC ENGAGEMENT

During the study process, the public was engaged at key points through public meetings and stakeholder/focus group meetings. A project website was also established to keep the general public informed about the project and important information that was being reviewed by the Policy Committee and the Technical Committee.

▼ MAP 1.1 JLUS FOCUS AREA



▼ MAP 1.2 WESTERN TRAINING AREA (GERNERALIZED)



STAKEHOLDER AND FOCUS GROUP MEETINGS

During the first four months of the study process, key stakeholders were interviewed and focus group meetings were held to identify compatibility issues and growth trends across the region. Over 100 people were interviewed as part of the process and included the major groups listed in Figure 1.2.

PUBLIC MEETINGS AND OUTREACH

The first public meeting to kick-off the process was held in December 2015 at the Killeen City Hall, City Council Chambers with approximately 40 people in attendance. At the kick-off meeting, introductions were made by Fort Hood's Garrison Commander and the City Manager of Killeen. A presentation was made at this meeting covering the study details and the process. The meeting concluded with a general discussion with the meeting participants.

As the study process moved forward, a project website was maintained to provide an opportunity for the region to learn more about the Joint Land Use Study. At the conclusion of Policy Committee and Technical Committee meetings, presentations from those meetings were posted on the website for public review.

Once the draft study was prepared and reviewed by Technical Committee and Policy Committee, a public meeting was held at the Killeen City Hall, City Council Chambers in October 2016.

After the public meeting, the Technical Committee reviewed the final draft for presentation to the Policy Committee. In November 2016, the Policy Committee reviewed and accepted the final study. In December 2016, a final public meeting was held at the Killeen City Hall where the study was accepted by the City Council.

▼ FIGURE 1.1 PUBLIC MEETING HANDOUT

▼ FIGURE 1.2 STAKEHOLDER AND FOCUS GROUPS

Municipalities
City of Killeen
City of Gatesville
City of Belton
City of Brownwood
City of Copperas Cove
City of Harker Heights
City of Temple
City of Nolanville
City of Lampasas

Counties
Bell County
Coryell County

Governmental Agencies
CTCOG
TXDOT
Texas Parks and Wildlife
Hill Country Transit District
US Army Corps of Engineers

Healthcare
Seton Hospital
Metroplex Hospital

Education
Central Texas College
Texas A&M Univ - Central Texas
Killeen ISD
Copperas Cove ISD

Community/Business Organizations
HOTDA
Killeen Chamber of Commerce
Keep Killeen Beautiful
CenTex Sustainability
Veterans Council
Workforce Solutions
Our Land Our Lives
Parrie Haynes Ranch

Utility Providers
Clearwater Water District
WCID #1
Oncor

Development Industry
Yalgo Engineering
W&B Development

Fort Hood
III Corps Staff
Operational Test Command
First Army Division West
Garrison
- DPW
- DPTMS
- DAO

REGIONAL PROFILE
SECTION TWO

REGIONAL PROFILE

The Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA) is growing in population, diversifying economically and demographically, and is one of the most affordable places in the state and country to live. The region has experienced population growth at a rate above the national average since at least 2010.

2.1 DEMOGRAPHIC PROFILE

The United States Census Bureau's Population Estimates Program (PEP) produces annual population and housing unit estimates for the United States, its states, counties, cities and towns. On May 19, 2016 the Census Bureau released its annual PEP update which included population estimates for cities and towns, and housing unit estimates for the United States, states and counties for July 1, 2015. [1] The PEP update also included breakdowns of natural increase (births minus deaths) and net migration, both domestic and international, between April 2010 and July 1, 2015, as well as for the year between July 1, 2014 and July 1, 2015. These estimates provide insight into the current and future population for the region.

2.1.1 CURRENT POPULATION

Table 2.1 shows the 2015 population estimates for the Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA) and the counties that make up the MSA. Bell County includes the cities of Killeen and Temple, the most populous cities in the MSA, and makes up 77 percent of the total MSA population. Copperas Cove, the MSA's third largest city, is located in Coryell County.

▼ TABLE 2. 1 KILLEEN-TEMPLE-FORT HOOD MSA: 2015 POPULATION ESTIMATES

	TOTAL POPULATION	% OF TOTAL POPULATION
Killeen-Temple-Fort Hood MSA	431,032	100%
Bell County	334,941	77%
Coryell County	75,503	18%
Lampasas County	20,588	5%

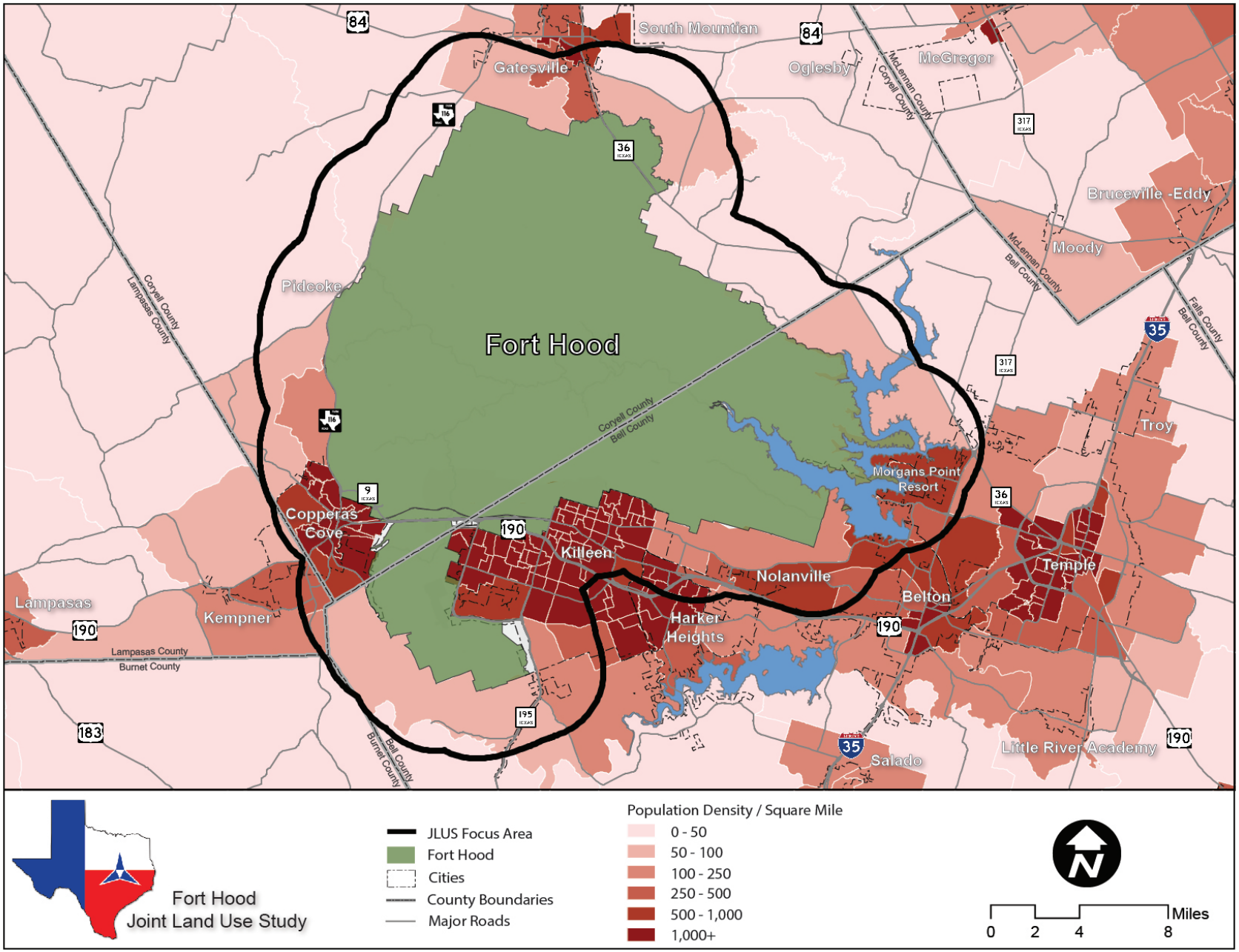
Source: U.S. Census Bureau, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015

▼ TABLE 2. 2 CITIES WITHIN THE JLUS STUDY AREA: 2015 POPULATION ESTIMATES

CITY	TOTAL POPULATION
Killeen	140,806
Temple	72,277
Copperas Cove	33,081
Harker Heights	29,142
Belton	20,547
Gatesville	15,724
Lampasas	7,687
Nolanville	4,774
Morgan's Point	353

Source: U.S. Census Bureau, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015

▼ MAP 2.1 REGIONAL POPULATION DENSITY (2010 CENSUS)



The Population Density Map (Map 2.1) demonstrates the current distribution of the population throughout the region at the Census Block Group level. As this map shows, the highest concentrations of population are within the region's cities, which are the economic hubs of the area.

2.1.2 POPULATION GROWTH

The Killeen-Temple-Fort Hood MSA experienced a population growth of 25,729 (6.4 percent) between 2010 and 2015. Relatively, the population growth rate in the Killeen-Temple-Fort Hood MSA was higher than the United States (4.1 percent) and lower than the state of Texas (9.2 percent) over the same period. As shown in Table 2.3, the majority of the MSA's population growth occurred in Bell County, which includes the City of Killeen.

Table 2.3 displays how population changed in the Killeen-Temple-Fort Hood MSA and its constituent counties. Population changes in a given location occur based on two factors: natural increase and net migration. Natural increase is simply the amount of births minus the amount of deaths that took place in a location over a given time. Net migration is the amount of people that moved into an area minus the amount that moved out of an area over a given time. Population growth in the Killeen-Temple-Fort Hood MSA is significant and is primarily attributable to natural increase. Note that the Census Bureau estimate for total population change includes a residual that is not attributable to natural increase or migration.

While the population growth in the Killeen-Temple-Fort Hood MSA is significant, it is also unique in that it appears to be the direct result of natural increase. Of the 388 Metropolitan Statistical Areas in the United States, the Killeen-Temple-Fort Hood MSA had the 80th highest population growth rate between 2010 and 2015. Killeen-Temple-Fort Hood MSA is also one of 118 MSAs that

▼ TABLE 2. 3 KILLEEN-TEMPLE-FORT HOOD MSA POPULATION CHANGE, 2010-2015

LOCATION	2015 POPULATION	POPULATION CHANGE 2010-2015		NATURAL INCREASE	NET MIGRATION
		TOTAL*	PERCENT	TOTAL	TOTAL
MSA	431,032	25,729*	6.35%	26,578	-1,479
Bell County	334,941	24,703*	7.96%	23,025	1,279
Coryell County	75,503	115*	0.15%	3,269	-3,338
Lampasas County	20,588	911*	4.63%	284	580

Source: U.S. Census Bureau, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015
*The total population change estimate includes a residual which is not attributable specifically to either net migration or natural increase.

experienced greater than 5 percent population growth between 2010 and 2015; of those 118 MSAs, only four experienced negative net migration over that time: Logan, Utah; Laredo, Texas; Bakersfield, California; and Killeen-Temple-Fort Hood[2].

2.1.3 REGIONAL AND STATE POPULATION GROWTH

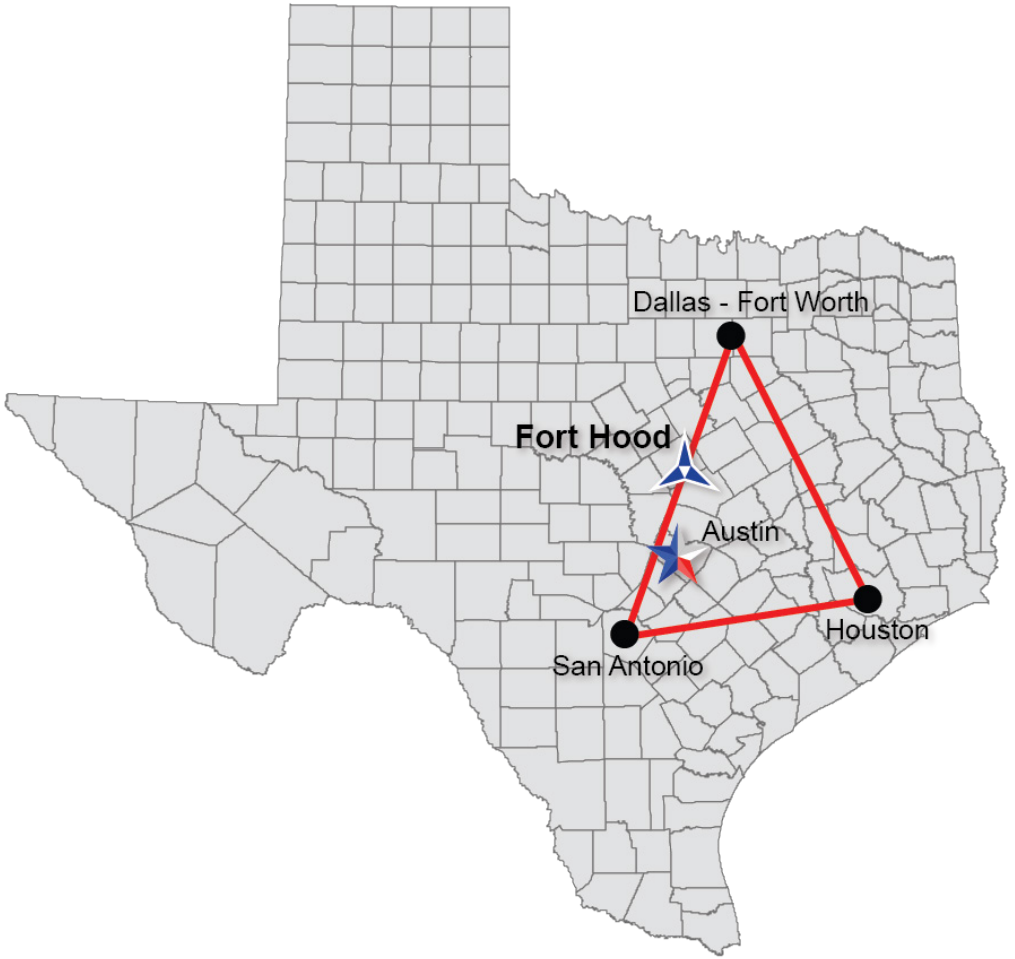
The Killeen-Temple-Fort Hood MSA is a part of a larger region known as the Texas Triangle, which includes the Dallas-Fort Worth, Austin, San Antonio, and Houston MSAs, and the regions between. As seen in Map 2.2, the Killeen-Temple-Fort Hood MSA region is centrally located between Dallas-Fort Worth and San Antonio.

The Texas Triangle includes six MSAs in total:

- Austin-Round Rock
- College Station-Bryan
- Dallas-Fort Worth-Arlington
- Houston-The Woodlands-Sugar Land
- Killeen-Temple-Fort Hood
- San Antonio-New Braunfels

The state of Texas experienced population growth of 2,323,009 new residents between 2010 and 2015, more than any other state. Over that same period, the MSAs that comprise the Texas Triangle experienced a population growth of 1,985,365, or 85.5 percent of the total state growth. Leading the State of Texas' growth, the Texas Triangle experienced more population growth than any single state during that period of time; California experienced the second greatest population growth with 1,890,315 new residents, nearly 100,000 less than the Texas Triangle.[2]

▼ MAP 2. 2 TEXAS TRIANGLE REGION



The state of Texas, the Texas Triangle, and the Killeen-Temple-Fort Hood MSA are expected to continue to grow in population. America 2050, the infrastructure planning and policy program of the Regional Plan Association, forecasts that the population of the Texas Triangle will nearly double between 2010 and 2050, increasing from approximately 20 million residents to over 38 million.[3] Population forecasts for the Killeen-Temple-Fort Hood MSA are similar to the larger region; the MSA is forecasted to have a population of nearly 700,000 by 2050, up from a 2010 population of 405,300 (see Table 2.5)[4].

RACE

Following national and state-wide trends, the Killeen-Temple-Fort Hood MSA has steadily become more racially diverse since at least 2000. As shown in Table 2.6, non-Hispanic whites still comprised the majority of the Killeen-Temple-Fort Hood MSA population in 2014, but made up a smaller share of the total population compared to 2000 and 2010. Comparatively, Hispanics or Latinos in 2014 comprised a much greater share of the total MSA population compared to 2000 and 2010. These local trends are a reflection of larger national and state trends; the Hispanic or Latino population made up 16.9 percent of the national population in 2014, up from 12.6 percent in 2000. In Texas, non-Hispanic whites in 2014 made up a plurality of the population rather than a majority (44.3 percent). That same year, Hispanics or Latinos comprised 38.2 percent of Texas' total population; the Texas Demographic Center projects that Hispanics or Latinos will become the plurality in Texas by the year 2024.[5]

2.2 ECONOMIC PROFILE

2.2.1 FORT HOOD ECONOMIC IMPACT

Fort Hood is a major economic contributor to both the Killeen-Temple-Fort Hood MSA and the state as a whole. The Texas Comptroller of Public Accounts estimates that Fort Hood contributed nearly $35.4 billion to the Texas economy and accounted for 201,538 total jobs statewide in 2015. Fort Hood's economic impact goes beyond the wages paid to the 52,725 on-post employees and 7,434 deployed soldiers; it includes payments for retirees, private housing costs, construction costs, and the Education Impact Aid generated due to Fort Hood's presence.

On July 9, 2015, the United States Army announced force reductions of 3,350 military personnel from Fort Hood. This reduction is part of an overall reduction of soldiers and civilians in the Army, designed to take place between fiscal years 2016 and 2018. By the end of fiscal year 2018, the Army plans to reduce the Regular Army from 490,000 to 450,000 Soldiers, and plans to reduce Army civilian employees by 17,000.[6]

The loss of 3,350 soldiers from Fort Hood is expected to cause moderate, though not significant, impacts to the communities of the Killeen-Temple-Fort Hood MSA. Once personnel reductions

▼ TABLE 2. 5 KILLEEN-TEMPLE-FORT HOOD MSA POPULATION PROJECTIONS

	TOTAL POPULATION	CUMULATIVE CHANGE	CUMULATIVE CHANGE %	5-YEAR CHANGE	5-YEAR CHANGE %
2000	330,726				
2005	357,533	26,807	8.1%	26,807	8.1%
2010	405,300	74,574	22.5%	47,767	13.4%
2015	431,032	100,306	30.3%	25,729	6.4%
2020	477,518	146,792	44.4%	46,486	10.8%
2025	512,117	181,391	54.8%	34,599	7.2%
2030	547,096	216,370	65.4%	34,979	6.8%
2035	583,643	252,917	76.5%	36,547	6.7%
2040	621,249	290,523	87.8%	37,606	6.4%
2045	659,006	328,280	99.3%	37,757	6.1%
2050	696,115	365,389	110.5%	37,109	5.6%

Sources: Texas State Data Center, Population Estimates and Projections Program; U.S. Census Bureau, Estimates of the Resident Population: April 1, 2010 to July 1, 2015

▼ TABLE 2. 6 PERCENT OF TOTAL POPULATION BY RACE FOR THE UNITED STATES, TEXAS, AND THE KILLEEN-TEMPLE-FORT HOOD MSA

	UNITED STATES			TEXAS			MSA		
RACE	2000	2010	2014	2000	2010	2014	2000	2010	2014
White (non-Hispanic)	69.1%	64.7%	62.8%	52.4%	46.4%	44.3%	59.2%	55.0%	52.6%
Black or African American	12.3%	12.5%	12.6%	11.5%	11.8%	11.9%	19.8%	19.3%	19.5%
American Indian and Alaska Native	0.9%	0.8%	0.8%	0.6%	0.5%	0.5%	0.8%	0.6%	0.8%
Asian	3.6%	4.7%	5.0%	2.7%	3.7%	4.1%	2.3%	2.4%	2.6%
Hispanic or Latino	12.6%	15.7%	16.9%	32.0%	36.7%	38.2%	15.7%	19.6%	21.5%

Sources: U.S. Census Bureau, 2000 Census Summary File 1, 2000; U.S. Census Bureau, 2010 Census Summary File 1, 2010; U. S. Census Bureau, 2010–2014 American Community Survey, 2015

are fully implemented, the Killeen-Fort Hood Regional Airport expects an approximate loss of $150,000 annually per the Fort Hood Force Reduction Assessment. In addition, the potential reduction in students with military parents will impact the Federal Impact Aid distributed to local school districts. In the Copperas Cove Independent School District, the number of federally connected students has declined in recent years with just over 36 percent that are federally connected with only 26.65 percent of the school population meeting the heavy Impact Aid standard. As a result, CCISD is expected to lose approximately $8.5 million per year over the next three years; however, those losses are being mitigated by a hold harmless provision that will limit the losses to $1 million in the first year and $2 million each year in years 2 and 3. Overall, the hold harmless provision will limit the more than $24 million total loss in impact aid to around $7 million during this three-year period. In the Killeen Independent School District, 45 percent of the enrollment is federally connected and near future losses in Impact Aid are not expected.

2.2.2 EMPLOYMENT

Total employment in the Killeen-Temple-Fort Hood MSA grew 24.5 percent between 2005 and 2015. Government employment has remained relatively stable since 2005, while private sector employment has accounted for most of the total increase.[7] Figure 2.3 shows change in total, private and government employment in Killeen-Temple-Fort Hood MSA between 2005 and 2015.

In the private sector, Trade, Transportation, and Utilities; Education and Health Services; and Leisure and Hospitality are the three largest industries. These industries also gained the most employees between 2005 and 2015. Trade, Transportation, and Utilities employment grew by 6,324 (31.3 percent), Education and Health Services by 7,240 (48 percent), and Leisure and Hospitality by 4,487 (46.1 percent) between 2005 and 2015. Although only the fifth largest industry in the MSA, Mining, Logging, and Construction also experienced a large employment increase between 2005 and 2015, gaining 2,724 employees (45.6 percent). Figure 2.4 shows private employment in the Killeen-Temple-Fort Hood MSA for the major industry categories between 2005 and 2015.

2.3 GROWTH INFLUENCES

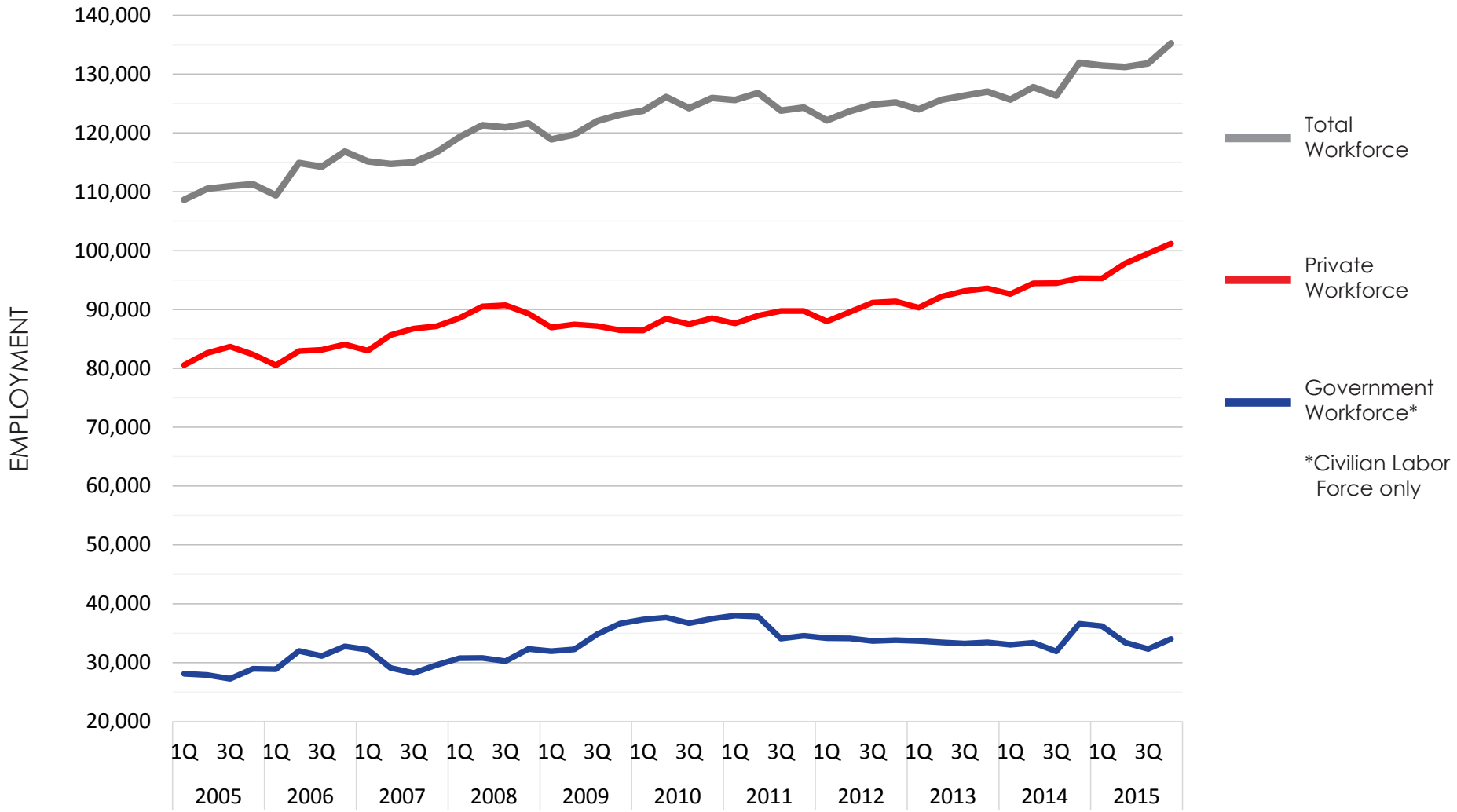
As noted in the population and economic profiles, despite the known future personnel reductions at Fort Hood, population and total employment is projected to increase in the Killeen-Temple-Fort Hood MSA. Although Fort Hood is a major economic contributor in the region, and its services attract many retirees and dependent families to the region, current and projected growth can also be attributable to other, non-military factors.

2.3.1 STRONG STATE AND REGIONAL ECONOMY

Texas experienced the greatest population growth of any state between 2010 and 2015, gaining 2,323,009 residents; 432,694 more new residents than California gained, which

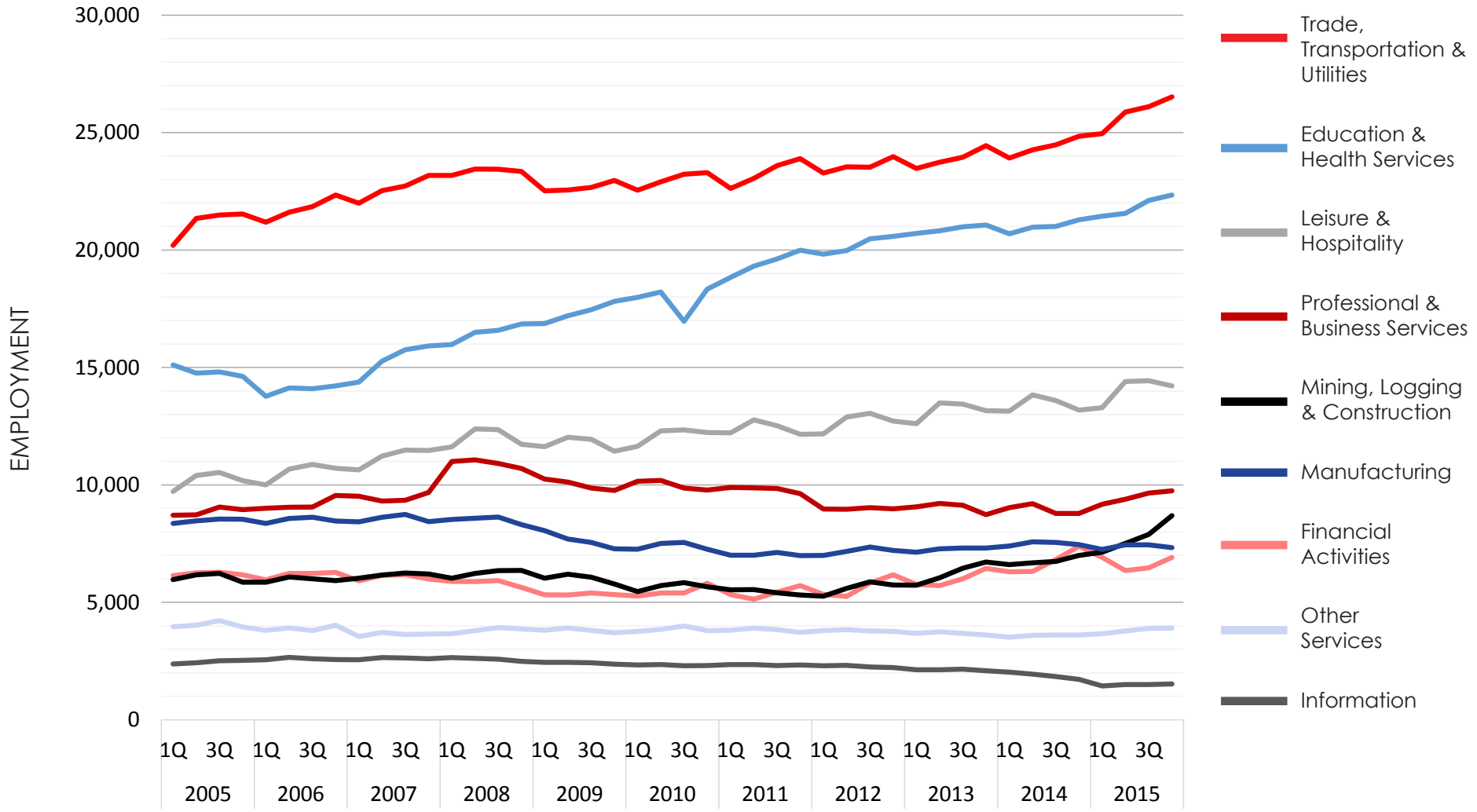
▼ FIGURE 2. 3 TOTAL EMPLOYMENT (CIVILIAN LABOR FORCE) IN THE KILLEEN-TEMPLE-FORT HOOD MSA, 2005-2015

Source: "Quarterly Employment and Wages (QCEW)," Texas Workforce Commission, 2016, http://www.tracer2.com/cgi/dataAnalysis/AreaSelection.asp?tableName=Industry



▼ FIGURE 2.4 PRIVATE EMPLOYMENT BY INDUSTRY IN THE KILLEEN-TEMPLE-FORT HOOD MSA, 2005-2015

Source: "Quarterly Employment and Wages (QCEW)," Texas Workforce Commission, 2016, http://www.tracer2.com/cgi/dataAnalysis/AreaSelection.asp?tableName=Industry



experienced the second greatest population growth with 1,890,315 new residents.[8] One factor likely attracting new residents is the strong economy of Texas. Between 2010 and 2015, only California added more jobs than Texas; 1,494,870 and 1,482,670, respectively. The jobs added in Texas over that time accounted for approximately 13.8 percent of all jobs added in the United States.[9] Table 2.8 shows the top ten states in terms of total jobs created between 2010 and 2015, and it is clear that California and Texas were the primary job generators over that time. Additionally, the unemployment rate of Texas in February 2016, was 4.4 percent - 0.5 percent lower than the national unemployment rate of 4.9 percent; this marked the 110th consecutive month that Texas' unemployment rate was at or below the national unemployment rate.[10]

Increased employment in Texas has contributed to higher personal incomes for Texas residents. Per capita personal income levels in Texas outpaced those of the United States between 2010 and 2015, increasing by 22.1 percent compared to the United States' increase of 18.4 percent.[11] Despite Texas' growth in per capita personal income, the cost of living has trended lower relative to the United States since 1990, as seen in Figure 2.5.[12]

▼ TABLE 2. 8 TOP TEN STATES BY TOTAL JOB GROWTH, 2010-2015

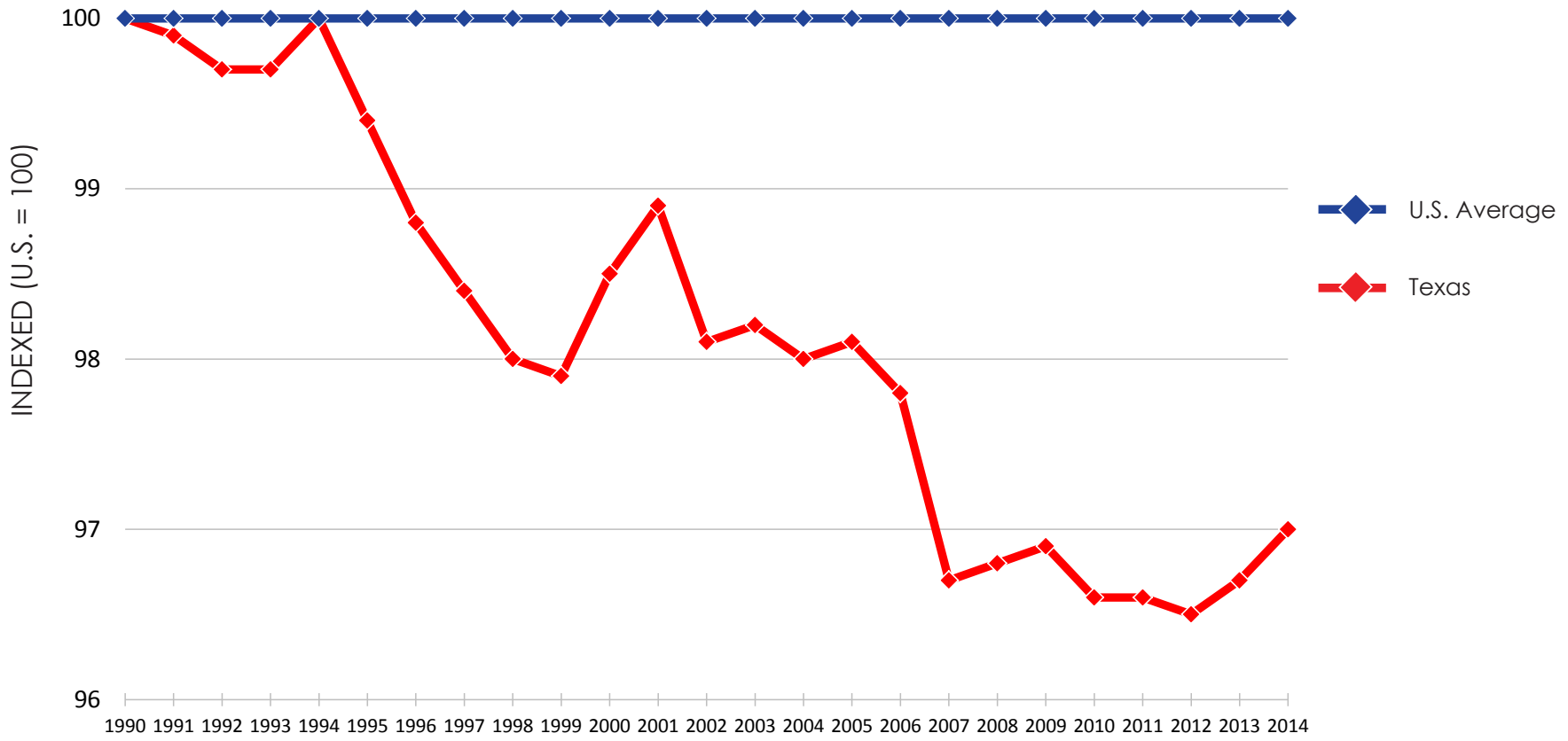
	STATE	TOTAL JOBS		TOTAL JOB GROWTH	% JOB GROWTH
		2010	2015		
1	California	14,001,730	15,496,600	1,494,870	10.68%
2	Texas	10,089,870	11,572,540	1,482,670	14.69%
3	Florida	7,103,950	7,925,300	821,350	11.56%
4	New York	8,344,020	8,984,890	640,870	7.68%
5	Michigan	3,755,890	4,146,600	390,710	10.40%
6	Georgia	3,744,740	4,107,960	363,220	9.70%
7	Ohio	4,921,690	5,280,850	359,160	7.30%
8	North Carolina	3,772,780	4,125,070	352,290	9.34%
9	Illinois	5,528,420	5,852,710	324,290	5.87%
10	Colorado	2,157,690	2,451,490	293,800	13.62%
	United States	128,150,010	138,885,360	10,735,350	8.38%

Sources: "Occupational Employment Statistics," Bureau of Labor Statistics, April 14, 2016, http://www.bls.gov/oes/tables.htm

In addition to being the center of population growth in the state of Texas, the Texas Triangle is the state's economic engine. The four primary metropolitan areas of the Texas Triangle – Houston, Dallas-Fort Worth, San Antonio, and Austin – each specialize in unique industries, limiting competition among the metro areas and allowing them to work together to further enhance the greater region's economic dominance. Major industries of the Texas Triangle include Energy, Transportation, Technology, and Finance.[13] Job growth in the Texas Triangle is expected to continue at its rapid pace through at least 2030, but is significantly dependent on the global petroleum market, and difficult to project.[14]

▼ FIGURE 2. 5 TEXAS INFLATION RELATIVE TO THE UNITED STATES SINCE 1990

Source: "Inflation Relative to the U.S. Since 1990: All Items," Compare 50, accessed July 7, 2016, http://www.compare50.org/chart/category/96/sub_category/503/display/518/chart/519/type/57/states/96



2.3.2 HOUSING

Housing costs and availability have historically been, and continue to be, significant factors when people consider where to live. Since roughly 2004, numerous factors have contributed to decreased homeownership rates and increased housing cost burdens nationwide, especially among Americans between the ages of 24 and 54. Housing cost burden is present when housing costs equal 30 percent or greater of a household's income, and is considered a severe burden when housing costs equal 50 percent or greater of total income. In 2015, 46 percent of renters nationwide aged 25-34 had housing cost burdens, and 23 percent had severe burdens.[15] As housing costs continue to rise in high-demand regions such as New York City, Washington, D.C., and the California Bay Area, more people are moving to Sun Belt regions in states such as Arizona, Nevada, Florida, and Texas, where housing is more affordable.[16] The sections below evaluate different factors associated with housing costs in the Killeen-Temple-Fort Hood MSA and how they compare nationally, state-wide, and regionally.

NEW HOME VALUE AND COST

Building permit values represent the estimated total value of all construction associated with a particular construction project. Figure 2.6 shows the average building permit values for new, single-family homes built between 2000 and 2015 in the Killeen-Temple-Fort Hood MSA, Texas, and the United States. These values provide an estimate of how much it would cost, on average, to construct a new, single-family home in each location. The average value of single-family home building permits in the Killeen-Temple-Fort Hood MSA have historically been lower than those in both the state of Texas and in the United States.[17]

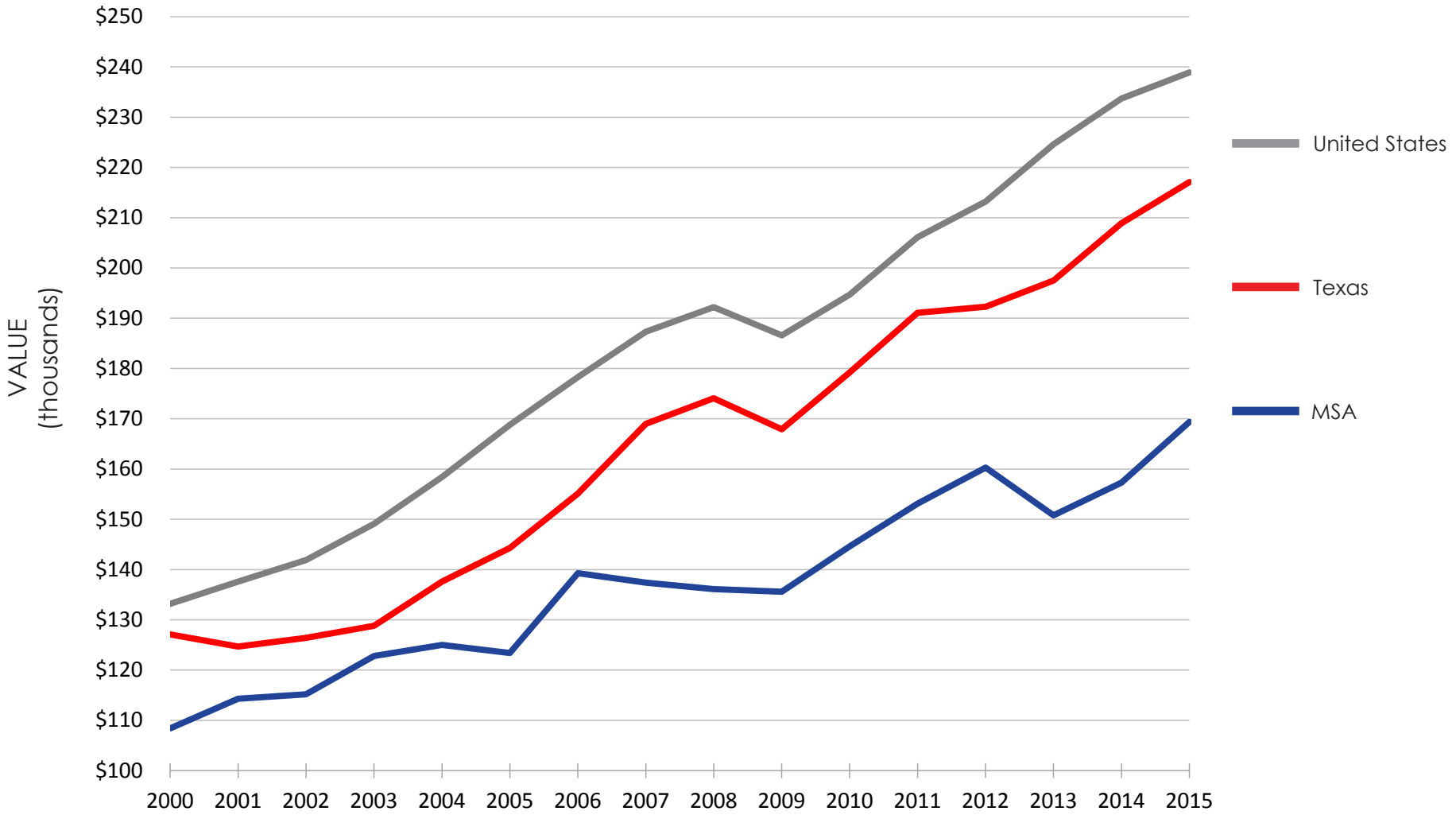
The relatively low value of building permits for single-family homes in the Killeen-Temple-Fort Hood MSA indicates that it is likely more affordable to build a new home in the Killeen-Temple-Fort Hood MSA than comparable areas within Texas and within the United States. While the average value of single-family home building permits has risen in the Killeen-Temple-Fort Hood MSA since 2000, it has been at a slower rate than Texas or the United States; between 2000 and 2015, the average value of single-family home building permits in the Killeen-Temple-Fort Hood MSA rose 56.3 percent, compared to 70.8 percent in Texas, and 79.4 percent in the United States. [18]

HOME SALE PRICES

The Texas A&M Real Estate Center provides data on housing activity in the Killeen-Temple-Fort Hood MSA dating back to 2008. When the median listing price of homes for sale in the Killeen-Temple-Fort Hood MSA are compared with those in nearby MSAs and in Texas, it is evident that housing in the Killeen-Temple-Fort Hood MSA is more affordable than housing in the surrounding regions, and more affordable than in the state as a whole. Figure 2.7 compares the median listing price of homes for sale in Texas, the Austin-Round Rock MSA, the Dallas-Fort

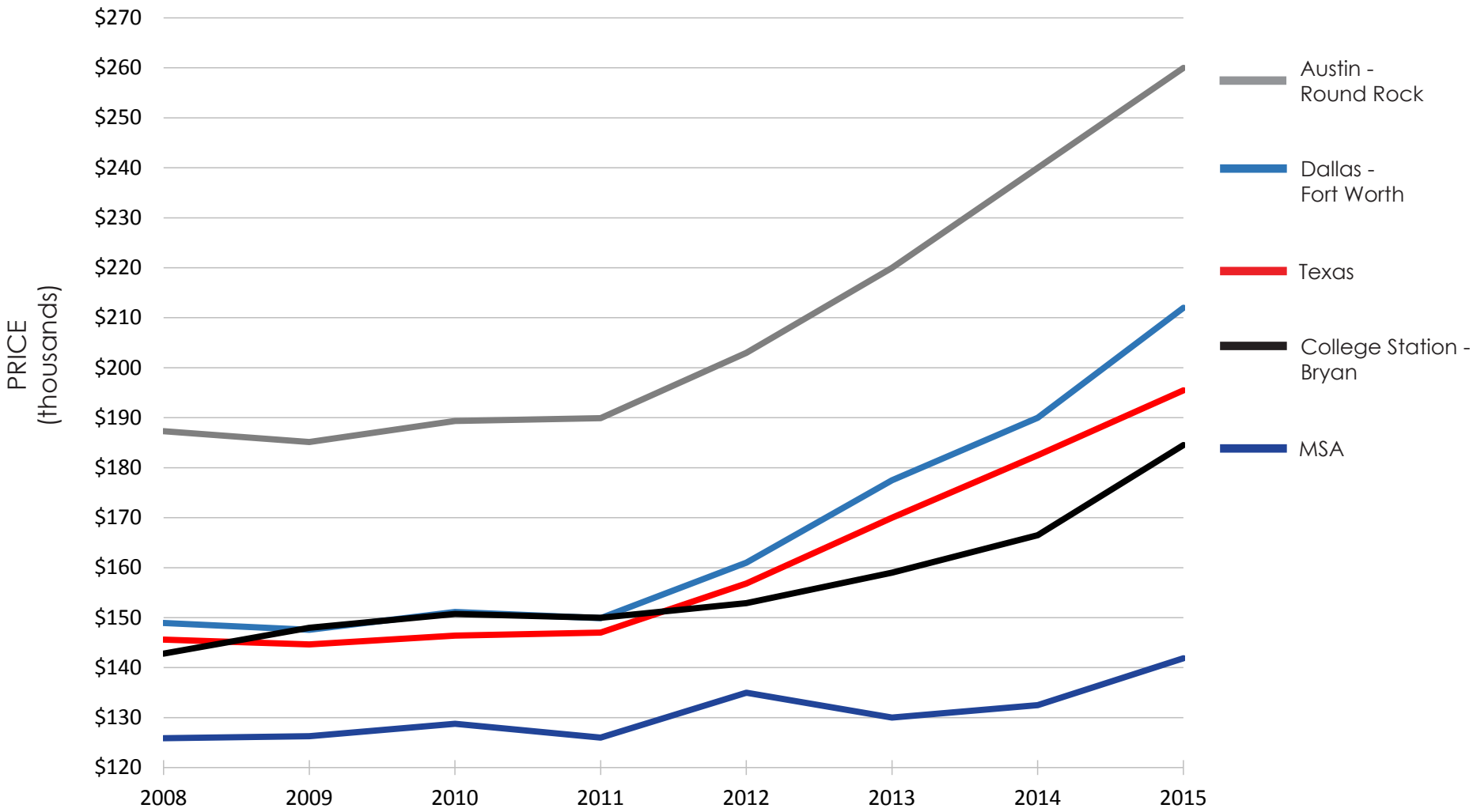
▼ FIGURE 2. 6 AVERAGE VALUE OF SINGLE-FAMILY HOME BUILDING PERMITS

Source: "Building Permits," Texas A&M University Real Estate Center, 2015, https://www.recenter.tamu.edu/data/building-permits/



▼ FIGURE 2.7 MEDIAN LISTING PRICE OF HOMES FOR SALE

Source: "Housing Activity," Texas A&M University Real Estate Center, 2015, https://www.recenter.tamu.edu/data/housing-activity/



Worth MSA, the College Station-Bryan MSA, and the Killeen-Temple-Fort Hood MSA. The figure shows that homes for sale in the Killeen-Temple-Fort Hood MSA have by far the lowest median listed price among the compared locations.[19]

Table 2.9 displays the cumulative increase between 2008 and 2015 of the median listing price of homes for sale in each of the examined regions, as well as how each region's 2015 median listing price compared to Killeen-Temple-Fort Hood MSA's. The information in the table represents the differences in median home prices shown in Figure 2.7, and further indicates that housing is significantly more affordable in the Killeen-Temple-Fort Hood MSA than in the surrounding region and elsewhere in the state. For example, the 2015 median listed cost of a home for sale in the Austin-Round Rock MSA, the MSA nearest Killeen-Temple-Fort Hood, is more than 80 percent higher than the median listed cost in Killeen-Temple-Fort Hood.[20]

▼ TABLE 2. 9 MEDIAN HOME SALE PRICE: RESIDENTIAL LISTINGS

	KILLEEN - TEMPLE-FORT HOOD	AUSTIN - ROUND ROCK	DALLAS - FORT WORTH	COLLEGE STATION - BRYAN	TEXAS
2008	$125,871	$187,319	$148,944	$142,796	$145,613
2009	$126,296	$185,150	$147,584	$147,959	$144,633
2010	$128,760	$189,356	$151,144	$150,762	$146,417
2011	$126,000	$189,900	$149,900	$150,000	$147,000
2012	$135,000	$203,000	$161,000	$152,900	$156,842
2013	$130,000	$220,000	$177,500	$159,000	$170,000
2014	$132,500	$240,000	$190,000	$166,500	$182,500
2015	$141,900	$260,000	$212,000	$184,538	$195,500
Cumulative % Rise	12.73%	38.80%	42.34%	29.23%	34.26%
% greater than KTFH MSA 2015	-	83.23%	49.40%	30.05%	37.77%

Sources:"Housing Activity," Texas A&M University Real Estate Center, 2015, https://www.recenter.tamu.edu/data/housing-activity/

2.4 SUMMARY OF DEMOGRAPHIC, ECONOMIC AND HOUSING CONDITIONS

The Killeen-Temple-Fort Hood MSA is growing in population, diversifying economically and demographically, and is one of the most affordable places in the state and country to live. Although Fort Hood has a major presence in the region, continued growth and diversification can be attributed to multiple factors, especially considering the projected decrease in soldiers stationed at the post and the projected continued increase in population in the area. Increasing job growth in key industries, its proximity to four major MSAs, and relatively affordable housing costs help make the Killeen-Temple-Fort Hood MSA an attractive place to relocate to, and helps contribute to the region's ability to retain residents. As described in the demographic profile , all of the population growth in the Killeen-Temple-Fort Hood MSA since 2010 can be attributed to natural increase. This indicates that current residents are having children and staying in place. While domestic net migration is negative, international net migration is positive. This is likely due to the recent reduction in Army personnel stationed and deployed overseas. It may also indicate that soldiers returning from overseas stations and deployments are staying in the area and having children.

In regard to housing affordability, continued population growth may not necessarily cause housing costs to rise at unexpected rates. Although, an increase in population and building permits will factor into rising housing costs if less developable land is available. Also, the population growth due to natural increase does not drive up housing costs at the same rate as population growth due to migration. This can be attributed to the fact that developers can anticipate natural growth, whereas growth due to immigration is largely unpredictable, and can lead to unforeseen influxes in the housing market, driving up costs.[21] If this is the case, housing costs in the Killeen-Temple-Fort Hood MSA should continue to be more affordable than those in the surrounding region and may contribute to future population growth.

DEMOGRAPHIC, HOUSING AND ECONOMIC FOOTNOTES

[1] U. S. Census Bureau, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015, May 19, 2016.

[2] Ibid.

[3] "Texas Triangle," America 2050, accessed July 6, 2016, http://www.america2050.org/texas_triangle.html.

[4] "Texas Population Projections Program," Texas Demographic Center, accessed June 29, 2016, http://osd.texas.gov/Data/TPEPP/Projections/.

[5] Ibid.

[6] Ricky D. Gibbs, City of Killeen: Force Reduction Assessment, June 15, 2016.

[7] "Quarterly Employment and Wages (QCEW)," Texas Workforce Commission, 2016, http://www.tracer2.com/cgi/dataAnalysis/AreaSelection.asp?tableName=Industry.

[8] U. S. Census Bureau, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015.

[9] "Occupational Employment Statistics," Bureau of Labor Statistics, April 14, 2016, http://www.bls.gov/oes/tables.htm.

[10] "Economic Outlook," The Texas Economy, 2016, http://thetexaseconomy.org/economic-outlook/.

[11] "Regional Data," Bureau of Economic Analysis, March 24, 2016,http://bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=1#reqid=70&step=30&isuri=1&7022=48&7023=0&7033=-1&7024=non-industry&7025=0&7026=00000,48000&7027=2015,2014,2013-,2012,2011,2010&7001=448&7028=30&7031=0&7040=-1&7083=levels&7029=48&7090=70.

[12] "Inflation Relative to the U.S. Since 1990: All Items," Compare 50, accessed July 7, 2016, http://www.compare50.org/chart/category/96/sub_category/503/display/518/chart/519/type/57/states/96.

[13] Robert Gilmer and Samuel Redus, "Texas Triangle: Economic Engine of the Southwest" (Texas A&M Real Estate Center, February 16, 2015), https://assets.recenter.tamu.edu/documents/articles/2091.pdf.

[14] John Egan, "What Will the Texas Triangle Look Like in 2030?," LawnStarter, 2016, https://www.lawnstarter.com/fort-worth-tx-lawn-care/what-will-the-texas-triangle-look-like-in-2030.

[15] Joint Center for Housing Studies of Harvard University, The State of the Nation's Housing 2015, 2015, http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs-sonhr-2015-full.pdf.

[16] Tim Henderson, "High Housing Costs Driving Population Shifts?," The Pew Chartiable Trusts, April 8, 2016, http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2016/04/08/high-housing-costs-driving-population-shifts.

[17] "Building Permits," Texas A&M University Real Estate Center, 2015, https://www.recenter.tamu.edu/data/building-permits/.

[18] Ibid.

[19] "Housing Activity," Texas A&M University Real Estate Center, 2015, https://www.recenter.tamu.edu/data/housing-activity/.

[20] Ibid.

[21] Dragana Cvijanovic, "Real Estate Finance: How Demographics Drive Housing Prices," HEC - Knowledge, April 15, 2012, http://www.hec.edu/Knowledge/Finance-Accounting/Financial-Markets/Real-estate-finance-How-demographics-drive-housing-prices.

2.5 REGIONAL DEVELOPMENT PATTERNS

The following is a brief summary of the land use and development patterns that are found within the JLUS Focus Area around Fort Hood. Included in this section is a summary of the generalized existing land uses at the parcel level and an analysis of the degree of land subdivision that has occurred in the Focus Area.

2.5.1 EXISTING LAND USE PATTERN

For the purposes of this study, a generalized classification of existing land uses was utilized. This system assigned one of five broad land use categories to each of the parcels within the JLUS Focus Area, which are displayed in Map 2.3 and Table 2.10. The five classes that were utilized for the analysis were:

- Undeveloped / Agricultural
- Residential
- Civic / Institutional
- Commercial
- Industrial

The analysis revealed that the majority of the land area within the JLUS Focus area, nearly 70%, was either in agricultural use or was otherwise undeveloped. The low intensity development patterns revealed in the analysis are particularly pronounced in the Coryell County portion of the Focus Area.

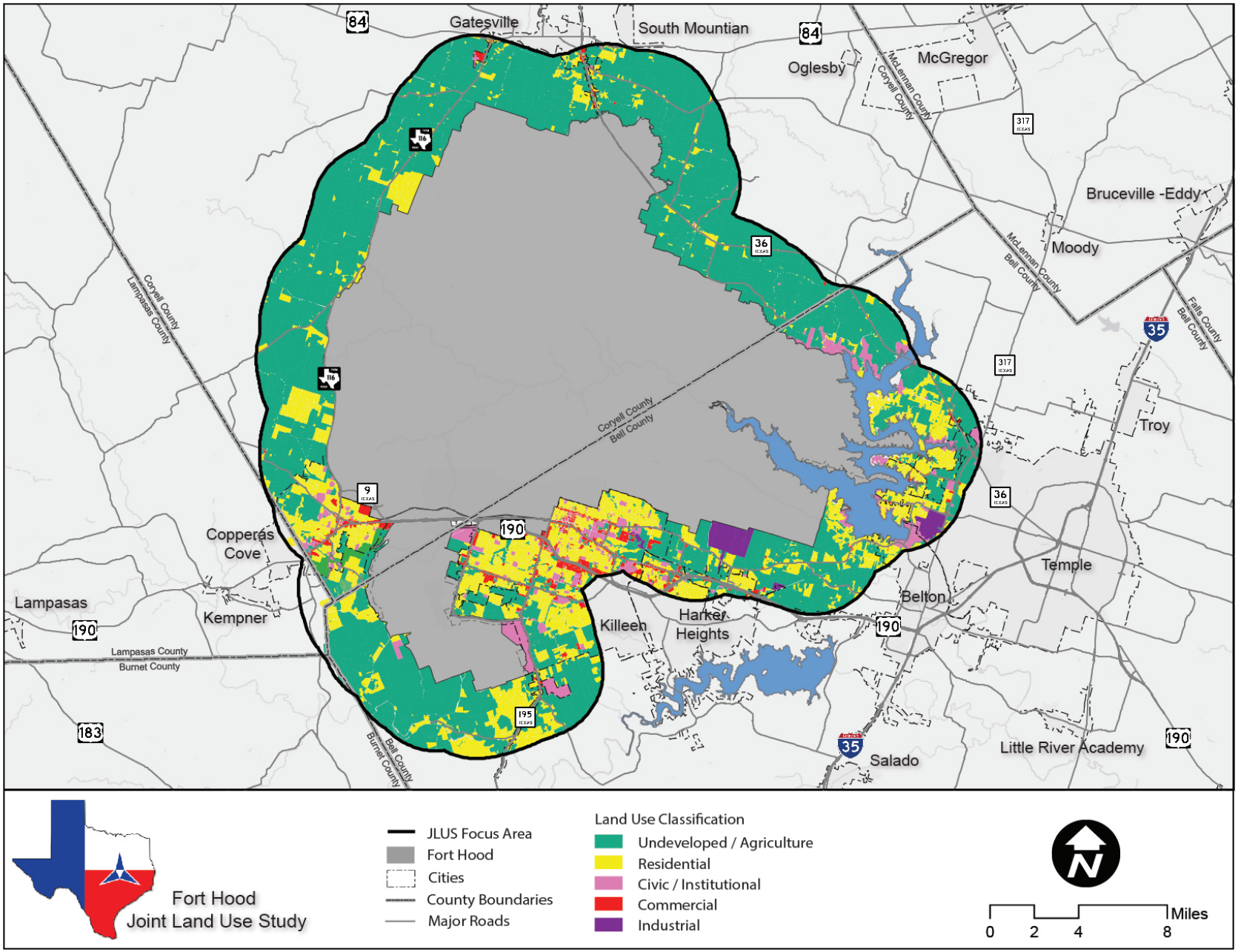
Accounting for just over 20% of the land area within the Focus Area, residentially developed parcels are found in the greatest concentrations within the region's cities, in particular in the portions of Killeen and Copperas Cove that are in close proximity to Fort Hood. Other significant or noteworthy concentrations of residential development in the region include the areas on the east side of Belton Lake, as well as some rural areas that are beginning to see concentrations of large lot residential development along FM 116 on the west side of Fort Hood and along Highway 195 south of Killeen and Highway 36 between Gatesville and North Fort Hood.

Nonresidential land uses - institutional / civic, commercial, and industrial comprise the remaining 8.5% of the acreage in the Focus Area. Commercial land uses are concentrated most heavily in the Focus Area in Killeen, Copperas Cove and Harker Heights along the major transportation routes that serve these cities, particularly the US 190 / Bus. 190 corridor which traverses the southern portion of the Focus Area from east to west and links Fort Hood and the communities on the south side of the installation to the I-35 corridor.

▼ TABLE 2.10 EXISTING LAND USE - JLUS FOCUS AREA

LAND USE	ACRES	PERCENT
Undeveloped / Agricultural	136,534	69.9%
Residential	42,369	21.7%
Civic / Institutional	9,698	5.0%
Commercial	4,315	2.2%
Industrial	2,362	1.2%
TOTAL	195,278	100.0%

▼ MAP 2.3 EXISTING LAND USE PATTERN



2.5.2 LAND SUBDIVISION PATTERN

In addition to the analysis of the general use of land within the Focus Area, the study analyzed the degree to which land has been subdivided. The degree of land subdivision that has occurred is typically indicative of the degree and type of development that has taken place, with urban areas seeing greater parcel density than more rural or undeveloped areas. This holds true in the area around Fort Hood, with the most intensive degree of land subdivision being observed within the cities that are situated along the US 190 corridor on the south side of Fort Hood. As the land use analysis reveals, these are the areas that also contain the greatest concentrations of developed land, with relatively dense residential development and supporting nonresidential uses in close proximity.

Map 2.4 details the pattern that emerged from the analysis, while Table 2.11 below provides a statistical breakdown of the various classes of parcels, based on their size, which were used to compose the map and perform the analysis.

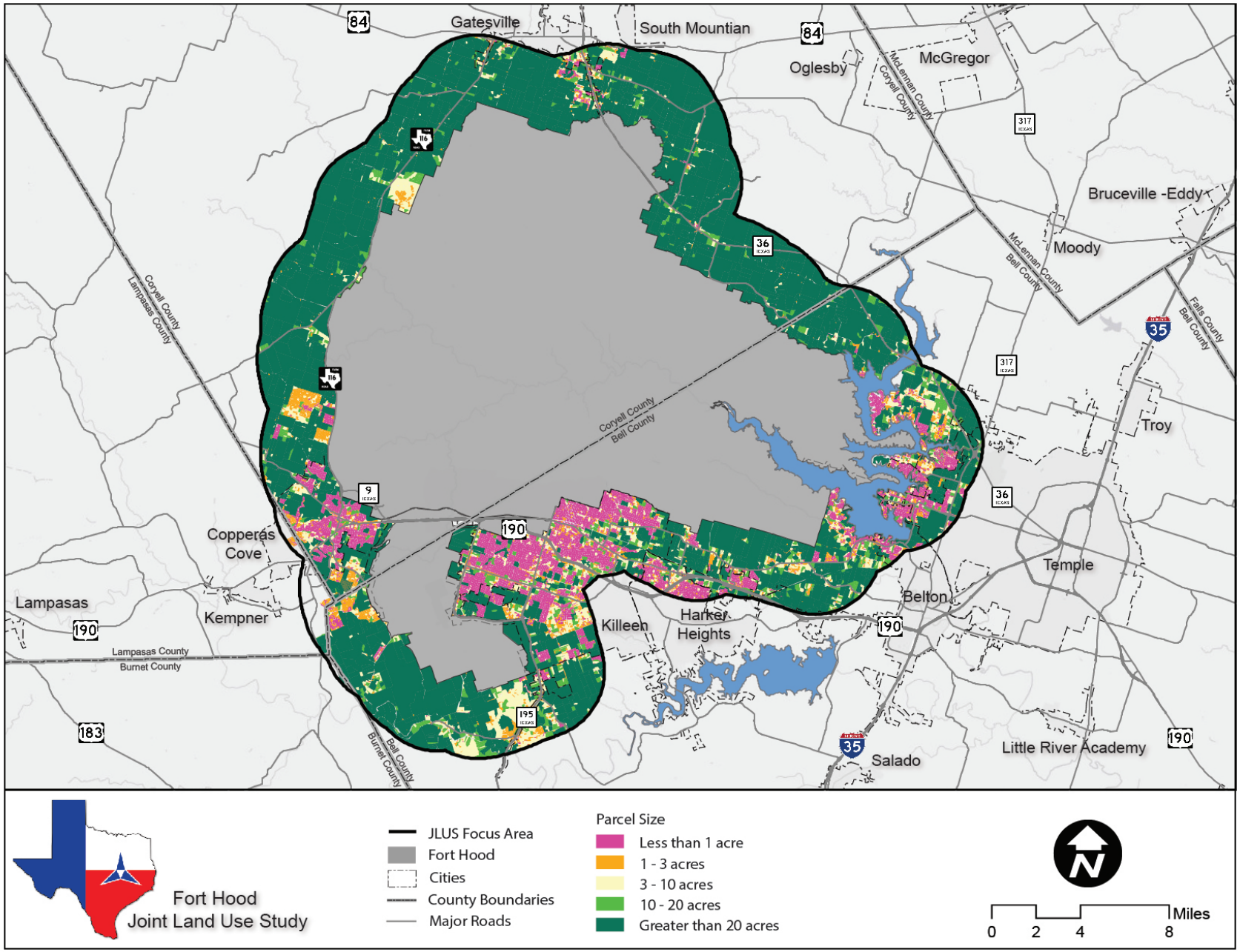
▼ TABLE 2. 11 PARCEL DENSITY - JLUS FOCUS AREA

PARCEL SIZE	NUMBER	PERCENT	ACRES	PERCENT
< 1 acre	68,681	84.6%	17,222	8.8%
1 to 3 acres	6,066	7.5%	9,308	4.8%
3 to 10 acres	3,250	4.0%	15,367	7.9%
10 to 20 acres	1,105	1.4%	12,584	6.4%
> 20 acres	2,089	2.6%	140,797	72.1%
TOTAL	81,191	100.0%	195,278	100.0%

The mapping of parcels by size reveals a pattern that closely mirrors the existing land use pattern, with parcels that are smaller than 1 acre aligning closely with the region's residential development pattern. Conversely, parcels that are larger than 20 acres in size also closely mirror the pattern of undeveloped / agricultural lands that are shown on the land use map. What is perhaps most revealing about the spatial distribution of parcels by size in the Focus Area is the emerging evidence of greater degrees of land subdivision occurring in some scattered rural areas around Fort Hood. These typically correspond to the scattered concentrations of residential development that are found in the rural areas around the installation, but can also serve as an indicator of potential future development as land is preemptively subdivided for prospective development opportunities.

As the statistical analysis shows, the amount of land that is contained in parcels larger than 20 acres in size is nearly equal to the amount of land that is identified as undeveloped / agricultural. While the same does not hold true as far as a correlation between the amount of land in parcels smaller than 1 acre in size and the amount of land in use for residential purposes, this lack of equivalence, even when adding in the parcels in the 1-3 acre category, reveals an important factor about development patterns in the region. This shows that a significant, though not predominant, amount of residential development has and is taking place in exurban areas lying just

▼ MAP 2.4 LAND SUBDIVISION PATTERN



2.5.3 DEVELOPMENT INFLUENCES

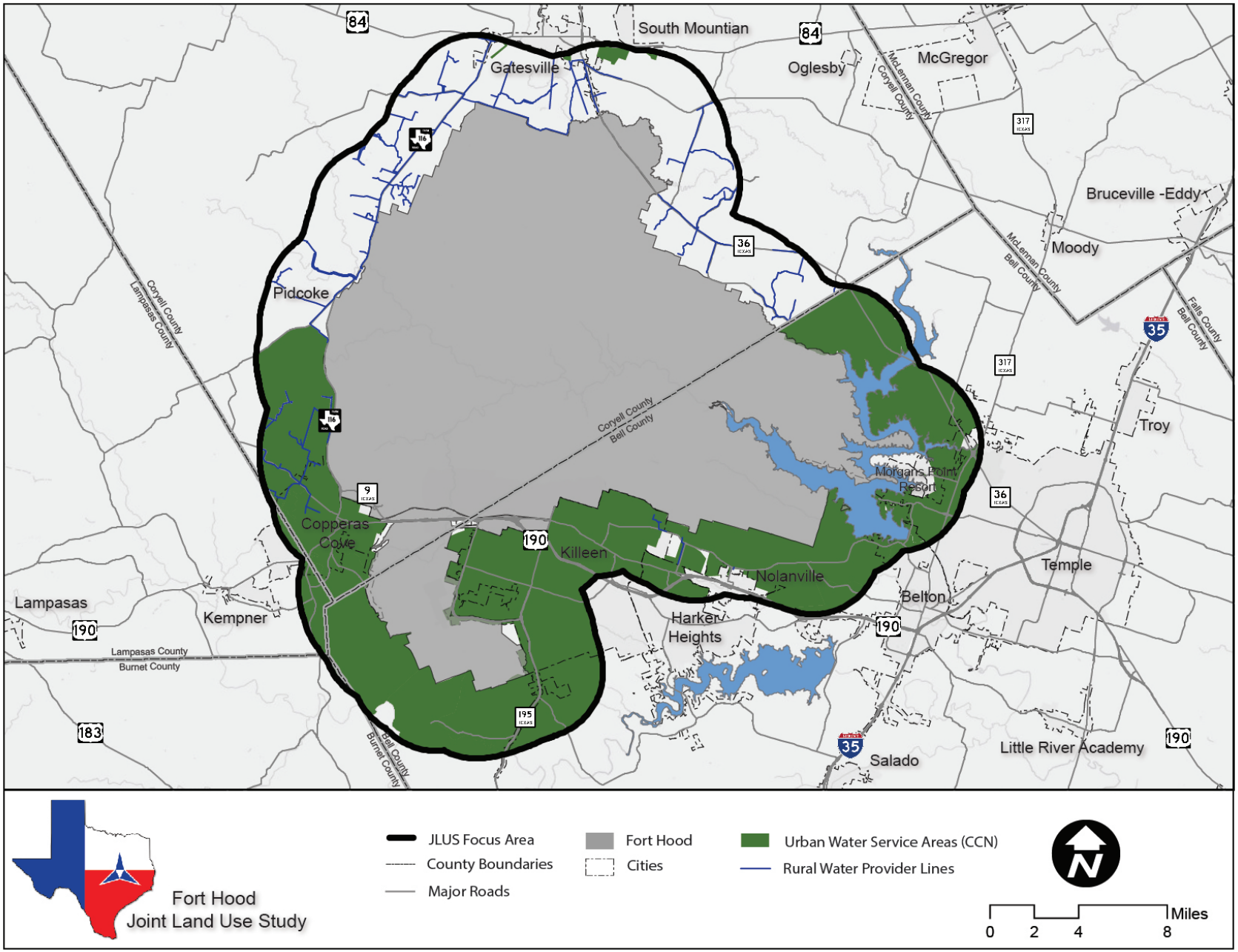
The physical conditions that influence growth are typically tied to the availability of infrastructure - along with market demand. While demand is often the most rational prerequisite for development, the installation of infrastructure can frequently serve to alter a market or shift the spatial context of future growth. As observed in the study, the region's transportation corridors and its largest employer (Fort Hood) have driven the majority of the growth toward the southern portion of the Focus Area.

The need to facilitate the movement of people to Fort Hood has driven massive investments in transportation infrastructure, and the utility services provided by the municipal governments in this area have facilitated the development of a large and relatively dense concentration of residential subdivisions, employment and commercial centers along this growing corridor.

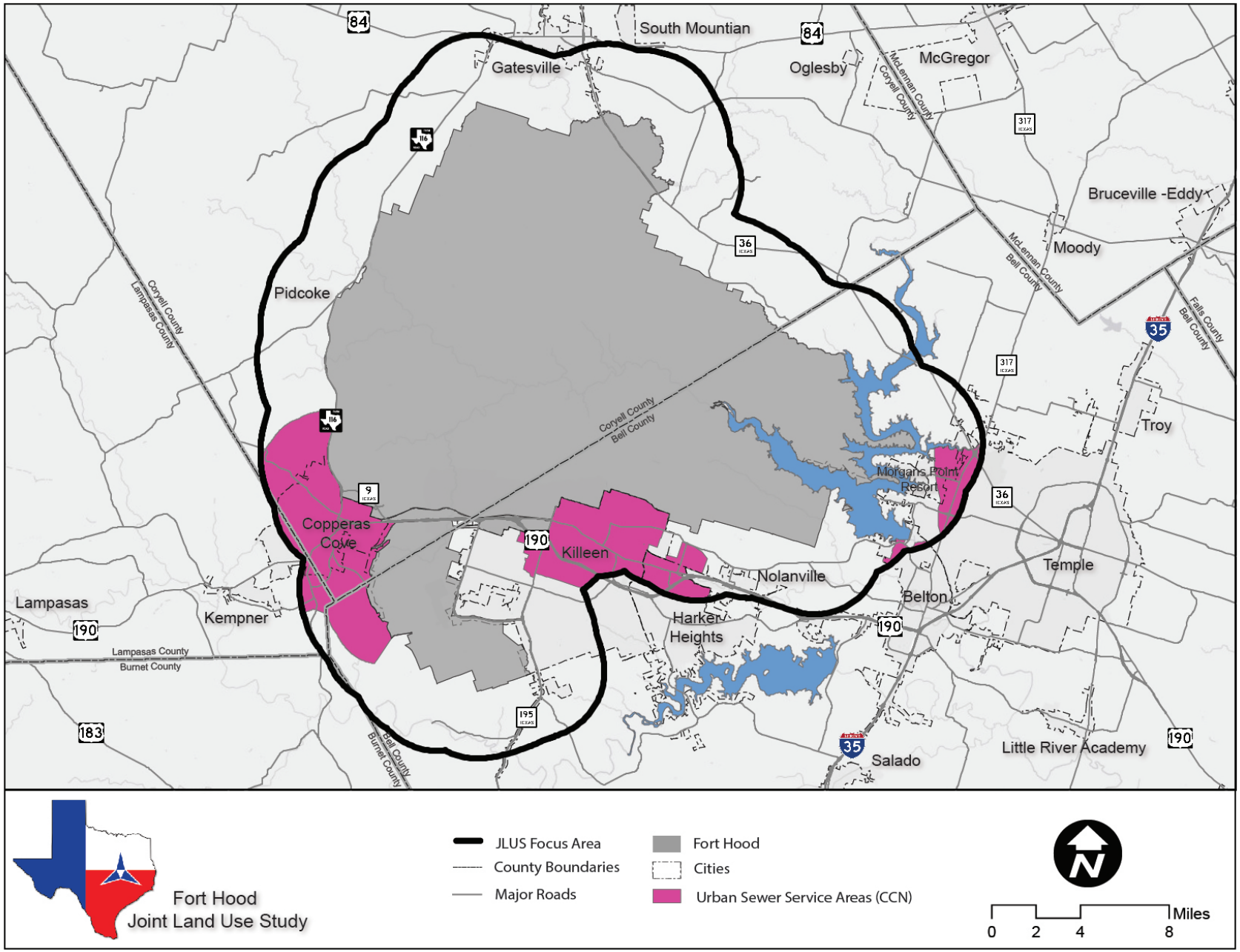
As land availability decreases in proximity to the primary corridors, there has been a tendency for local governments, and by extension agencies such as TXDOT, to help facilitate the expansion of development into once rural areas. Evidence of this is seen along the Highway 195 corridor south of Killeen and along the east side of West Fort Hood near Robert Gray Army Airfield, and is emerging along the FM 116 corridor north of Copperas Cove and the Highway 36 corridor south of Gatesville. In each of these circumstances, some combination of road infrastructure, utility extensions, or proximity to employment has served to begin driving growth in these areas, although to different and relative degrees when looking at the region as a whole. While continued growth is a net positive for the region and its residents, understanding the conditions and actions that can influence, or conversely discourage, the direction of growth is critical to ensuring that growth is directed toward those areas that will have the greatest benefit for the region. In the context of this study, beneficial growth primarily refers to that which has the least, or ideally no, negative impact to Fort Hood, in terms of encroachment into areas where the compatibility of the development may negatively affect the installation's operations, training, testing and power projection missions.

Among the potential main drivers of further growth in the region from an infrastructure perspective are the availability of public water and sewer utilities. Maps 2.5 and 2.6 detail areas where the TX Public Utility Commission has granted Certificates of Need and Convenience for water and sewer utilities, respectively, as well as the location of rural water provider service lines in the Focus Area. While the potential for sewer service in rural areas is not as widespread as the potential for water service, the provision of just one of the two can serve as a significant change agent in terms of the conversion of land from undeveloped to a developed use.

▼ MAP 2.5 WATER SERVICE AREAS / CERTIFICATES OF NEED AND CONVENIENCE



▼ MAP 2.6 URBAN SEWER SERVICE AREAS



The other primary growth driver is road improvement projects, including ongoing efforts to improve US 190 to Interstate standards in anticipation of designation as I-14. This future designation, while somewhat "administrative" in nature, can have a significant effect on regional growth. This, in turn, could serve to push future growth into areas that are currently rural. Other transportation routes that could help to facilitate growth as improvements are made, or just by their presence, providing connectivity to employment centers are the FM 116 and Highway 36 corridors which traverse Fort Hood's western and northeastern boundaries respectively. As such, studying the potential effect of any projects to improve the capacity of these will be critical moving forward.

A final observation on the factors that can serve to influence growth relates to the regulation of development by local governments. Latter portions of this study go into greater detail on the particular nature of the authority and extent of each jurisdiction's land use regulatory authority, primarily from a compatible use perspective. In terms of inducing or discouraging growth, land use regulations, or as in the case of counties in Texas, the lack of most authority other than regulating land subdivision, can be a significant driver of where development occurs.

Zoning regulations, which are only applicable in the cities, can both serve to concentrate development in beneficial areas, or it can drive growth toward areas that are unregulated. While much of the growth that might be of some concern from a compatibility perspective would be dependent on municipal utility service, and therefore, in most cases, annexation, even low density growth in rural areas can prove to be incompatible when it encroaches into areas that are subject to military training impacts. Conversely, when improperly applied, zoning regulations can also drive growth into areas that may encroach on military operations, training, testing and power projection missions, if the regulatory standards allow for uses or types of development that are incompatible with a specific impact.

2.6 ENVIRONMENT

This section of the regional profile provides information on key environmental issues relevant to compatible growth at Fort Hood including:

- Endangered Species
- Invasive Species
- Alternative Energy
- Air and Water
- RF Spectrum
- Air Quality

2.6.1 ENDANGERED SPECIES

Managing and monitoring Federally-listed threatened and endangered (T&E) species is a significant natural resource management obligation for the region. In the JLUS study area, the Army and Fort Hood manage the majority of land and the bulk of management responsibility lies with the Army. In accordance with the Endangered Species Act (ESA), the Army must assist in the recovery efforts of all listed T&E species and their habitats currently under the Army's land management authority. The ESA requires all federal agencies to conserve (i.e., use all methods and procedures necessary to bring any listed species to the point where protections pursuant to the ESA are no longer necessary.

The sections below describe the issues of current and potential encroachment from Federally threatened or endangered species, provide background on the local encroachment situation, describe the current situation, and provide conclusions and recommendations to address the challenge.

ENDANGERED SPECIES EXISTING CONDITIONS

Three known endangered species are known to occur in the JLUS focus area: whooping crane (*Grus Americana*), black-capped vireo (*Vireo atricapilla*) and golden cheeked warbler (*Dendroica chrysoparia*). The whooping crane only occurs as a rare transient. The U.S. Fish and Wildlife Service (USFWS) recovery team meetings have recognized that black-caped vireo and golden cheeked warbler populations on and around Fort Hood are important for range-wide recovery of the two species.

The monarch butterfly (*Danaus plexippus*), which stops at Fort Hood and surrounding areas during migration, and the smooth pimpleback mussel (*Quadrula houstonensis*), which can be found in waters on and around the installation, are candidates for federal listing. In addition to federally-listed species, the state threatened Texas horned lizard (*Phrynosoma cornutum*) has been recorded. No current or proposed critical habitat is located within the JLUS focus area.

▲FIGURE 2.8 BLACK-CAPPED VIREO (LEFT), GOLDEN CHEEKED WARBLER (RIGHT)

Five Central Texas Freshwater mussels are listed as Candidate species for listing by USFWS.[1] These mussels are:

- Texas fatmucket (*Lampsilis bracteata*)
- Golden orb (*Quadrula aurea*)
- Smooth pimpleback (*Quadrula houstonensis*) – occurs on Fort Hood
- Texas pimpleback (*Quadrula petrina*)
- Texas fawnsfoot (*Truncilla macrodon*)

Although USFWS determined that listing the species as threatened or endangered under the ESA is warranted, their listing at this time is precluded by higher priority listing actions. The earliest the Service expects to begin work on a proposed rule for the central Texas mussels would be in FY 2017.

▲ FIGURE 2.9 TEXAS HORNED LIZARD

▲ FIGURE 2.10 SMOOTH PIMPLEBACK

ENDANGERED SPECIES – CHALLENGES

Challenges that the region could face include:

- Supporting and maintaining the mission of the largest armored force in the U.S. Army by limiting natural resources encroachments and by providing quality, realistic, sustainable training lands.
- Protecting, managing, maintaining and monitoring milkweed and monarch butterflies in order to assist with the species recovery with a view to prevent its listing as threatened or endangered.
- Supporting and conducting leading, innovative scientific research that will help protect Fort Hood's training lands from future endangered species listings.

ENDANGERED SPECIES SUMMARY

Working closely with USFWS, Fort Hood has made tremendous progress in mitigating the impacts of its two endangered species since these birds were listed in the early 1990s,

culminating in the 2015 Biological Opinion (BO) which removed all remaining training restrictions on post and implemented an adaptive management strategy to maintain future flexibility. The 2015 BO also anticipated future construction projects and provided ample incidental take to account for anticipated habitat loss.

ENDANGERED SPECIES FOOTNOTES

[1] USFWS, "Frequently Asked Questions on the 12-Month Finding for Five Central Texas Mussels."

2.6.2 INVASIVE SPECIES

Invasive species are plants and animals that invade and quickly dominate natural habitats. Invasive species are usually imported from outside North America. Common examples include kudzu vine (*Pueraria lobata*) or gypsy moth (*Lymantria dispar*).

The sections below describe the issues of current and potential encroachment from invasive species at Fort Hood, provide background on the local encroachment situation, describe the existing situation, and provides conclusions and recommendations to address the challenge.

INVASIVE SPECIES BACKGROUND

Invasive species can be either plants or animals that invade and dominate natural habitats. Several invasive species of primary concern in the region are giant reed (*Arundo donax*), salt cedar (*Tamarix ramosissima*), Chinese tallow tree (*Sapium sebiferum*), kudzu (*Pueraria montana var. lobata*) and B-Dahl (*Bothriochola bladhii*).

ANIMALS

Zebra mussels (*Dreissena polymorpha*) are small, destructive mussels that can spread by attaching themselves to boats and their and trailers.[1] Currently, six Texas lakes are classified as infested with zebra mussels: Texoma, Ray Roberts, Lewisville, Bridgeport, Dean Gilbert (a small lake in Sherman) and Belton.[2] These mussels can cause remarkable environmental and economic damage by outcompeting aquatic life, damaging vessels, hindering water recreation activities, clogging water pipes and threatening local water supplies.

Other animals include the invasive feral hogs (*Sus scrofa*) that are causing significant safety risks to Soldiers and damaging both training lands and targetry.

INVASIVE SPECIES SUMMARY

Although invasive species are not a major issue on Fort Hood, controlling the invasive plant, insect, and mammal species will prevent any future degradation of training areas and ranges with respect to safety, training, and wildlife management.

INVASIVE SPECIES FOOTNOTES

[1] texasinvasives.org, "Hello Zebra Mussels. Goodbye Texas Lakes."

[2] Texas Parks and Wildlife, "Exotic and Invasive Species: The Zebra Mussel Threat."

2.6.3 ALTERNATIVE ENERGY

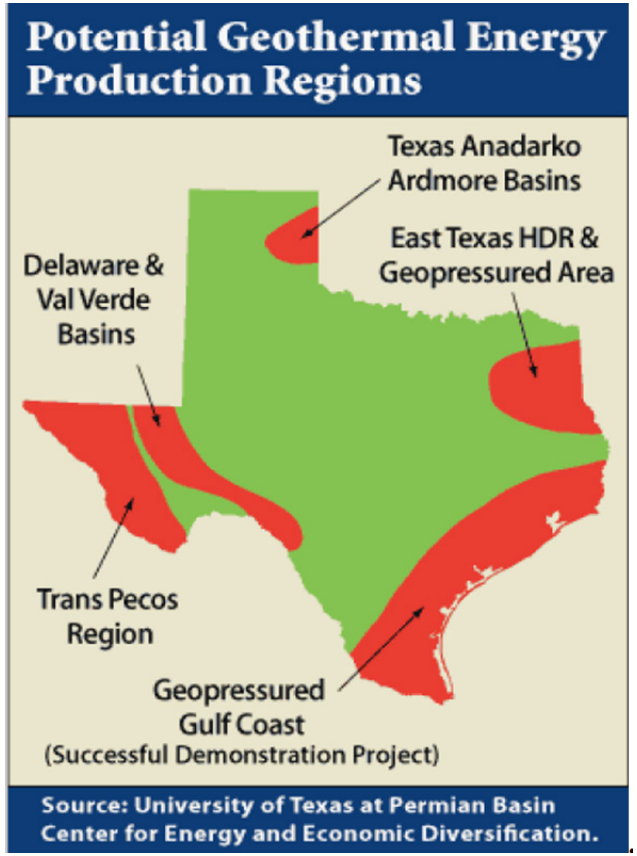
OVERVIEW

Texas has long been a major energy producer and exporter. Texas is the top oil and natural gas producing state in the country, and due in parts to an aggressive Renewable Portfolio Standard (RPS) Texas has also become a leader in the renewable energy industry. The Texas State RPS created goals of 5,880 megawatts (MW) of renewable energy capacity by 2015 and 10,000 MW capacity by 2025, both of which have been exceeded.[1] As of July 2016, Texas had 16,631 MW of installed wind energy capacity, the most in the nation.[2] The state also had a total of 566 MW of installed solar capacity in 2015, tenth most nationally.[3] Overall, Texas had 19,132 MW of installed renewable energy capacity as of April 2016, or 10.4 percent of total installed renewable energy capacity in the United States.[4]

Renewable energy development can create encroachment challenges between the military and the community through airspace constraints, spectrum constraints and safety constraints. Wind energy development near the post can create airspace constraints for helicopter training missions and for transient aircraft utilizing Fort Hood's airfields. Wind energy development within the line-of-sight of Fort Hood radars – such as airfield radars, Next-Generation Radar (NEXRAD) which tracks weather, or other radar facilities that require uninterrupted line-of-sight to execute the mission – can create spectrum interference and impact mission operations. The potential reflectivity and glare caused by solar energy development may create safety concerns for helicopter and fixed-wing aircraft pilots at Fort Hood.

GEOTHERMAL ENERGY

Geothermal energy represents the natural, internal heat of the Earth that is stored within the rock and fluid. The potential for geothermal power development in Texas is incredible. The



▲ FIGURE 2.11 GEOTHERMAL ENERGY POTENTIAL

Texas Bureau of Economic Geology estimates that Texas has the geothermal potential of 20,000 megawatts, enough to satisfy one-third of Texas' energy needs.

The Coryell-Ouachita Group, Inc. (CCEG) is an energy company that conducts hydrocarbon and geothermal/solar energy exploration and production. Although not considered a main region of Texas for geothermal production, there is interest in building a pilot plant in Central Texas that could generate 4.6 megawatts of electricity, enough to power 1,200 homes. If proven successful, a full scale station could generate 80 megawatts, enough to power more than 40,000 homes.[5]

SOLAR ENERGY

Texas installed 212 MW of solar electricity in 2015, ranking it ninth nationally, and as of 2015 Texas has a total of 566 MW of installed solar capacity, ranking it tenth nationally. Over the next five years, Texas is expected to install 4,612 MW of solar electric capacity.[6] Texas accounts for roughly 14 percent of the entire estimated United States technical potential for utility-scale photovoltaic (PV).[7]

As of April 2016, Texas had 471 MW of solar energy under construction and 1,073 MW of solar energy in development.[8] There are approximately 40 major solar installations (at least 1 MW) operating, under construction, or under development in Texas. Roughly half of those installations are within or directly adjacent to the Texas Triangle region. At least 14 major solar installations are in the San Antonio region and at least 6 are in the Austin region.[9] There are currently no major solar energy developments constructed or in the pipeline in the Killeen-Temple-Fort Hood MSA located on private land. However, a 132-acre solar farm is under construction on Fort Hood that could provide the installation with up to 40 MW of solar energy capacity.[10] There is also a planned solar PV project covering approximately 120 acres west of Fort Hood between Fort Hood and Copperas Cove which could provide up to 25 MW of solar energy capacity.[11] Fort Hood also currently utilizes a four-acre PV solar field, near the Liberty Village community on post, which has a capacity of 684 kilowatts (kWs) and powers 300 homes in the military housing complex.[12] In addition, Fort Hood is developing an on-post solar farm and an off-site wind turbine farm, which will add a total of 65 MW of renewable energy capacity for the post. This development is the first hybrid wind/solar project in the Army, and will be the first to combine on-site and off-site facilities.[13]

Tools such as the Solar Glare Hazard Analysis Tool (SGHAT), developed by Sandia Laboratories, allow solar developers to predict if solar projects will produce glare and if so, what type of glare and during what time of day.[14] Photovoltaic (PV) solar panel producers are also taking preventative measures to ensure PV arrays do not produce high reflectivity and/or glare, and also ensure panels absorb the most sunlight possible. PV

panels are coated with anti-reflective material and the surface of the panels are roughened to reduce reflectivity.[15]

The goal of PV installations is to absorb as much sunlight as possible, as opposed to Concentrating Solar Power (CSP) technology which reflects and concentrates sunlight to create heat. There are currently no CSP projects in Texas, and CSP projects comprise only 10 percent of existing solar capacity in the United States and only 3 percent of capacity currently under construction. [16]

Potential PV solar facilities are not likely to create significant impacts to Fort Hood mission operations or the community, but planning of solar projects in the Killeen-Temple-Fort Hood MSA should be closely monitored by Fort Hood and the community to prevent incompatible development.

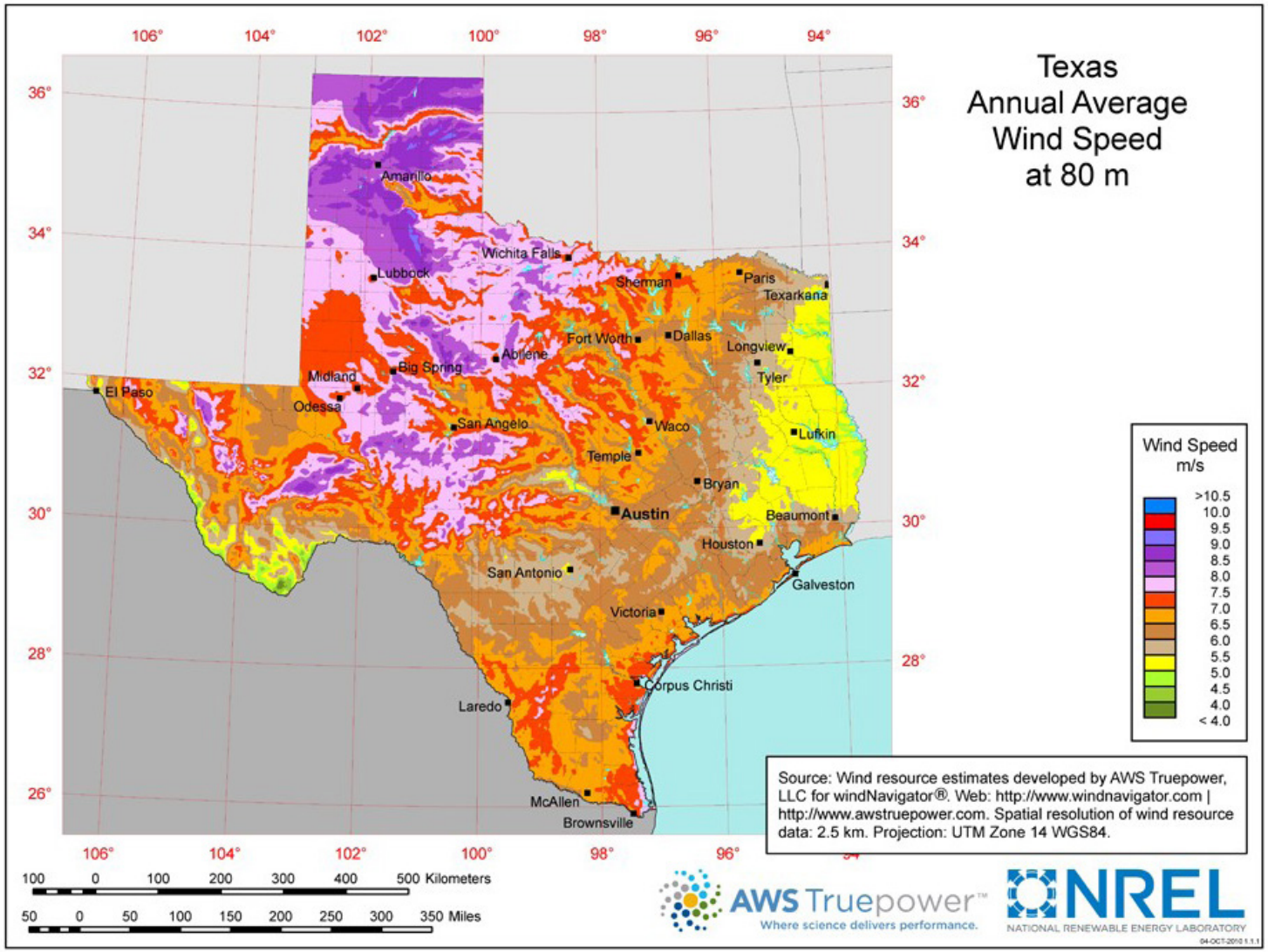
WIND ENERGY

Much of the land in Texas is flat and has high wind potential, which lends itself well for wind energy development. The environmental issues and regulatory framework, along with impact analysis and mitigation are covered in the AWEA Siting Handbook.[17] Permits and archeology issues on private land are more lenient in Texas than in other states, further incentivizing wind energy development.[18] Wind power in Texas consists of over 40 different wind farm projects. Texas has the largest installed wind energy capacity in the United States with 16,631 MW as of July 2016.[19] Wind power accounted for 9 percent of the electricity generated in Texas during 2014.[20]

Wind energy is limited, in part, to transmission infrastructure. Wind turbines can be constructed much faster than transmission infrastructure, and most places suitable for wind energy are in remote and rural areas. Transmission lines can cost up to $1.5 million per mile and long distance transmission can take 2.5 to 3.5 years to construct.[21] In 2009 the Public Utility Commission of Texas (PUCT) took steps to connect these rural areas with high wind potential in western Texas to the population centers in eastern Texas by creating Competitive Renewable Energy Zones (CREZ). Five CREZs were established in western Texas and multiple transmission providers were selected to build transmission infrastructure to interconnect wind energy developments in the CREZs to the electric grid.[22] The CREZ project was completed in 2013 and allows the transmission of 18.5 MW of wind-generated electricity to the more populated areas of the state, including the Killeen-Temple-Fort Hood MSA.[23]

The vast majority of Texas' wind energy capacity, approximately 70 percent, is located in western Texas. Approximately 22 percent is located along the Gulf Coast, and approximately 8 percent is in northern Texas.[24] As of March 2015 there were no constructed wind turbines in the Killeen-Temple-Fort Hood MSA. There were 88 wind turbines total located in the nine counties adjacent to the MSA, 86 of which are located at the Goldthwaite Windfarm in Mills County, northwest of Lampasas County.[25]

▼ MAP 2.7 TEXAS WIND SPEED [26]



As seen in Map 2.7, the highest annual average wind speeds at 80 meters above ground level in Texas are located in western Texas and in the Panhandle. Average annual wind speeds near the Killeen-Temple-Fort Hood MSA are moderate.[26]

Fort Hood has plans to purchase wind-generated electricity as part of the Cotton Plains Wind Project. The Cotton Plains Wind Project is a planned windfarm located on private land in Floyd County, Texas, approximately 275 miles northwest of Fort Hood. The Cotton Plains windfarm will be owned by a subsidiary of Apex Clean Energy Holdings, LLC, and Fort Hood will purchase energy from the windfarm pursuant to a Renewable Energy Supply Agreement (RESA) which would support the financing of the windfarm. The nameplate capacity of the Cotton Plains windfarm would be approximately 51 MWs.[27] The RESA with Cotton Plains will increase the share of electricity generated from renewable sources used by Fort Hood, but should have no impact on mission operations at Fort Hood. The turbines will not be located on the installation or near any mission activities, and will be far enough from the post that both airspace obstructions and spectrum encroachment will not be an issue.

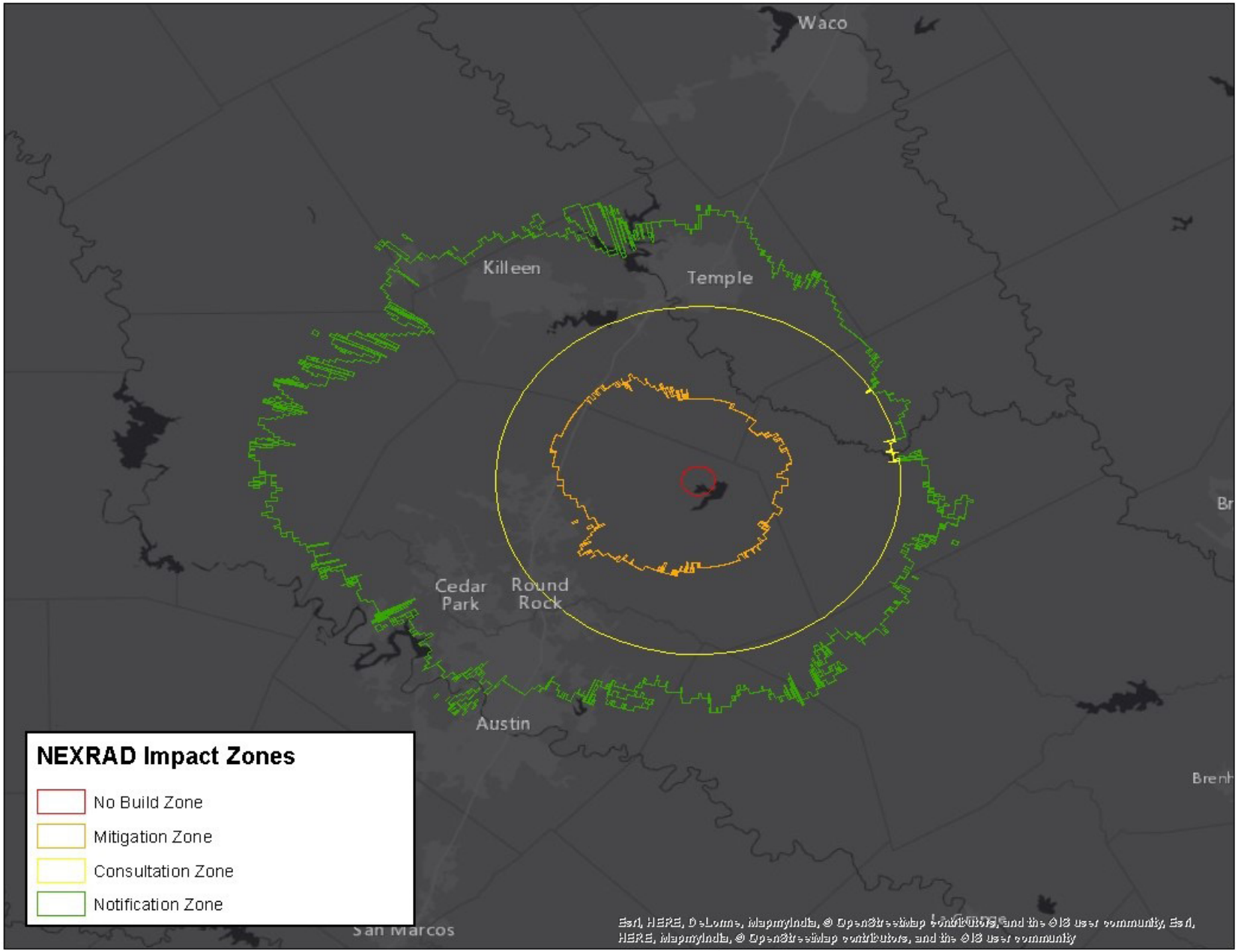
Wind energy development can also create spectrum interference issues for military missions. Wind energy development within approximately 30 miles of Fort Hood's Digital Airport Surveillance Radar (DASR) or within its Next- Generation Radar (NEXRAD) weather tracking radar's impact zones (Map 2.8) could create spectrum interference issues. Tall structures such as wind turbines can impede a radar's line of sight, and rotating blades can create false targets or mask incoming aircraft for a DASR, and create clutter for a NEXRAD, impacting its ability to detect weather systems. [28]

WESTERN TRAINING AREA

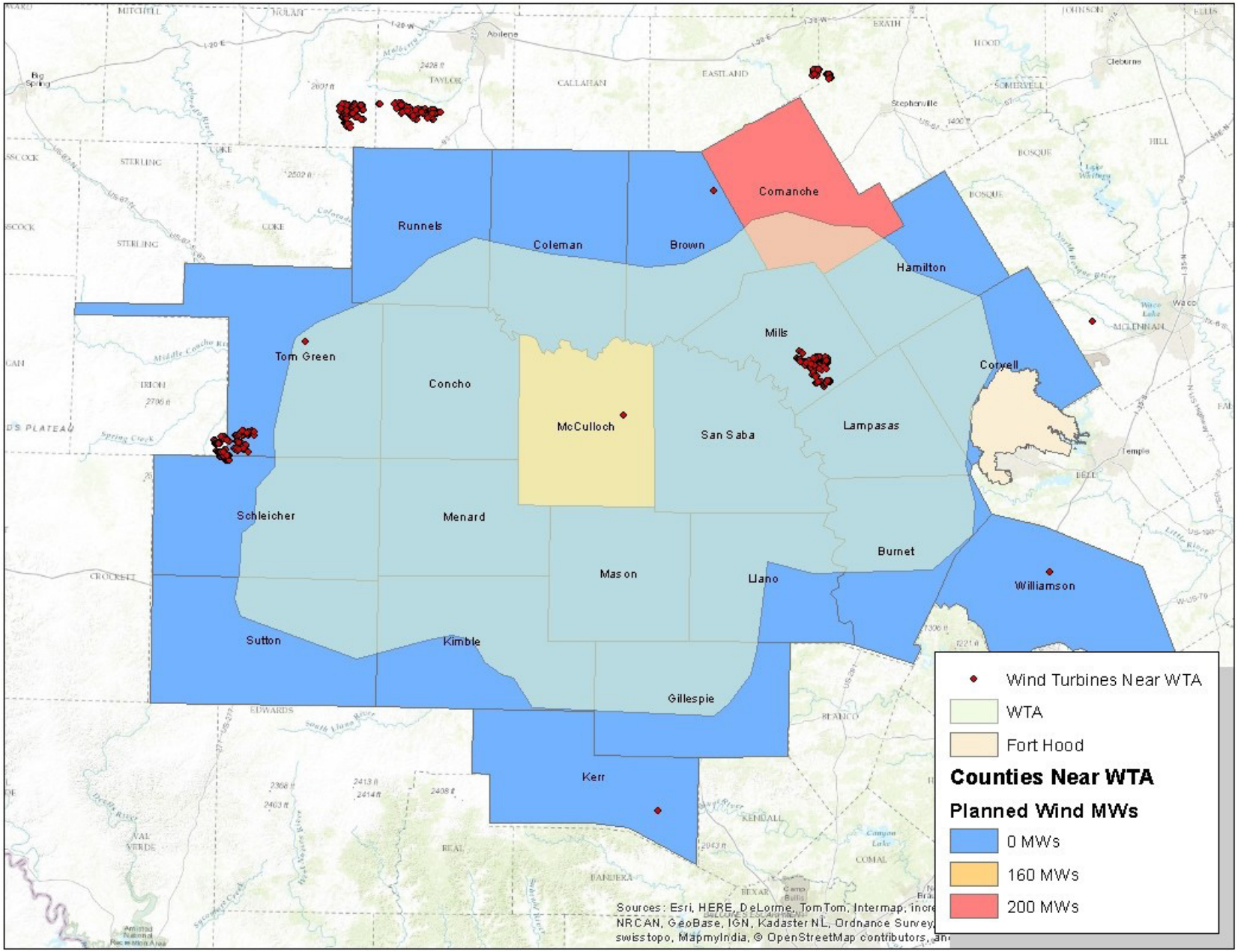
Map 2.9 displays the Fort Hood Western Training Area (WTA), the counties below and near the WTA, wind turbines below and near the WTA, and the counties near the WTA that have proposed wind energy developments. The wind farm in Mills County, described above, includes the only large group of wind turbines within the WTA as of March 2015.[29] A wind farm covering portions of Tom Green, Schleicher, and Irion counties is located approximately five miles west of the western-most portion of the WTA. According to the Electric Reliability Council of Texas (ERCOT) new wind energy development is proposed in two counties below and near the WTA. In McCulloch County, 160 MWs of wind energy are projected to be constructed and on line by December 2016, and 200 MWs of wind energy are planned to be built in Comanche County in 2017.[30]

Access to the electric grid via long haul electric transmission towers is important when considering the development of large-scale wind energy developments in sparsely populated areas such as central and west Texas. Tall transmission towers, like windmills, can create airspace restrictions for flying missions.

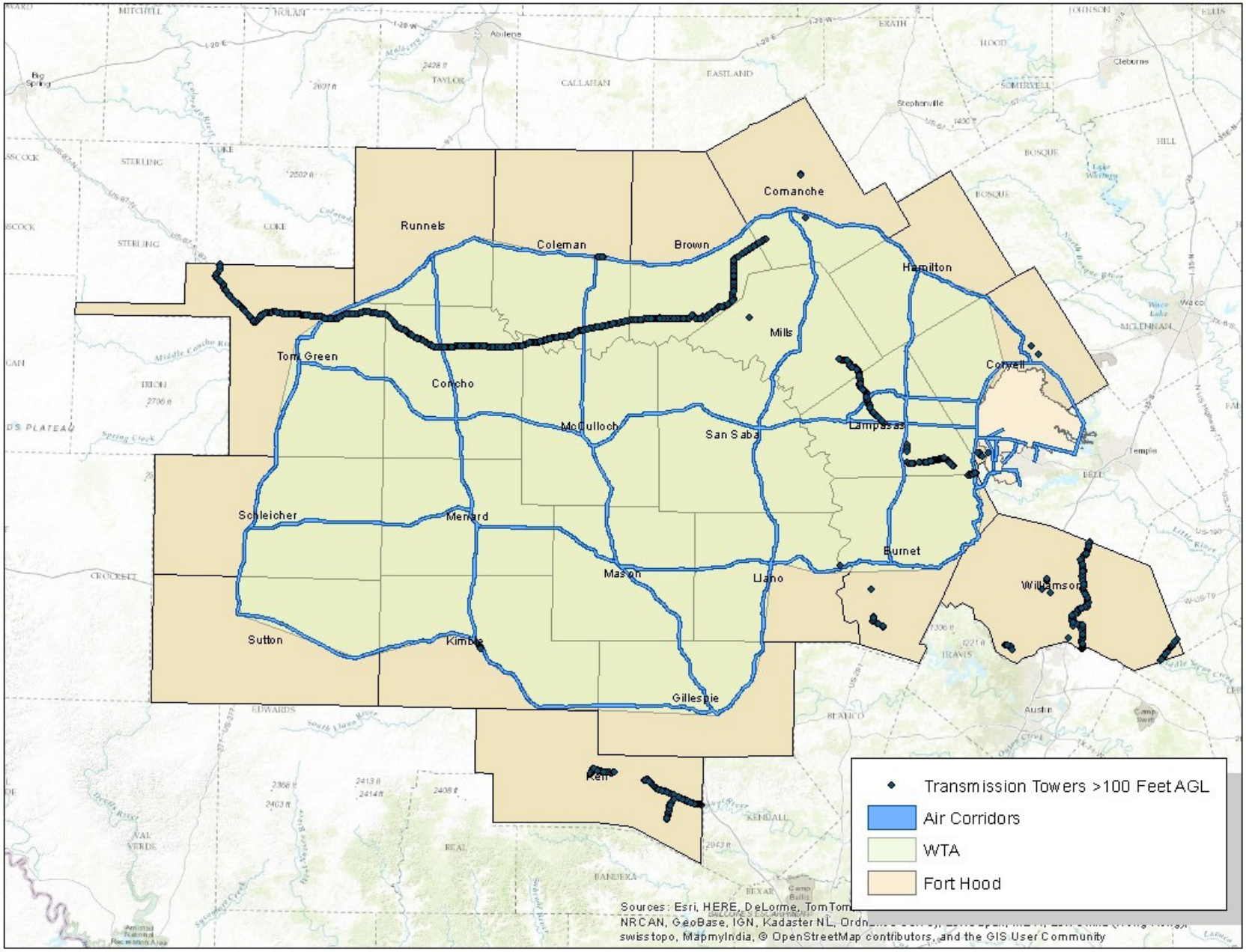
▼ MAP 2.8 NEXRAD IMPACT ZONES



▼ MAP 2.9 WIND ENERGY EXISTING AND POTENTIAL LOCATIONS AND THE WESTERN TRAINING AREA



▼ MAP 2.10 TRANSMISSION TOWERS IN THE WESTERN TRAINING AREA



Map 2.10 displays transmission towers taller than 100 feet above ground level (AGL) in the counties below and near the WTA. Also shown are the air corridors within the WTA and their proximity to the tall transmission towers. The tallest transmission tower in this area is 210 feet AGL and most air corridors in the WTA have a floor of approximately 1,500 feet AGL.[31] Transmission towers and lines do not currently present significant encroachment challenges to WTA flying activities. There are currently no plans for long haul or high-capacity transmission lines through or near the WTA, which are used to connect wind energy developments with centers of high population.

ALTERNATIVE ENERGY SUMMARY

Renewable energy, most notably wind and solar energy, has no current significant impacts on Fort Hood operations or within the Killeen-Temple-Fort Hood MSA community. However, new renewable energy development near Fort Hood or beneath Fort Hood associated helicopter flight routes have the potential to impact operations.

Photovoltaic solar energy facilities in Texas have the potential to reflect sunlight and create safety issues for pilots. As outlined in previous sections, there are many tools and procedures in place to both analyze potential glare issues of proposed solar facilities as well as reduce glare and reflectivity of current PV installations. Potential PV solar facilities are not likely to create significant impacts to Fort Hood mission operations or the community.

Wind energy development near military training areas can create physical obstructions and create spectrum interference. Although wind energy development in and near the Killeen-Temple-Fort Hood MSA is not as feasible as in the western parts of Texas, conditions (natural, political, and economic) are present for wind energy development to occur in the future. This is evidenced by the large wind farm in Mills County, mentioned in previous sections. Wind energy development should be closely monitored by both Fort Hood and the surrounding communities to prevent potential incompatible wind energy development.

RECOMMENDATIONS

- Continue coordination with the DOD Clearinghouse on potential alternative energy development in the region.
- Coordinate with ERCOT to be aware of proposed alternative energy and/or grid interconnections in Central Texas.
- Monitor the Generator Interconnection Status Reports published monthly by ERCOT (http://www.ercot.com/gridinfo/resource) to identify potential incompatible renewable energy development. These reports are likely to be the first instance of publicly available information regarding large energy developments.
- Encourage solar energy developers to use glare analysis tools such as SGHAT (https://share.sandia.gov/phlux) and to engage community leaders and Fort Hood to prevent incompatibilities.
- If able, create a publicly releasable fact sheet identifying the

requirements for aircraft training and operations to inform potential renewable energy developers and help prevent incompatible development.

ALTERNATIVE ENERGY ENDNOTES

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[2]Electric Reliability Council of Texas, Generator Interconnection Status Report, July 1, 2016, http://www.ercot.com/content/wcm/lists/91621/GIS_REPORT__June_2016.xlsx.

[3]"Texas Solar," Solar Energy Industries Association, accessed July 26, 2016, http://www.seia.org/state-solar-policy/texas.

[4]"Texas State Energy Profile," U.S. Energy Information Administration, January 21, 2016, https://www.eia.gov/state/print.cfm?sid=TX.

[5] Coryell-Ouachita Group, "Renewable Energy."

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[7]Anthony Lopez et al., U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis, July 2012, http://www.nrel.gov/docs/fy12osti/51946.pdf.

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[9] Ibid.

[10] "Fort Hood Gets Solar, Wind Farms in Army's Largest Energy Project," ArmyTimes, January 28, 2016, http://www.armytimes.com/story/military/2016/01/28/fort-hood-gets-solar-wind-farms-armys-largest-energy-project/79482582/; U.S. Army Environmental Command, Environmental Assessment for Implementation of Solar Photovoltaic Renewable Energy Enhanced Use Lease at Fort Hood, October 2014, http://www.hood.army.mil/dpw/Environmental/Files/pnotice/FinalEAandDraftFNSIforEITFSolarArrayProject17Oct14.pdf.

[11] Fort Hood Real Property Office, "Renewable Energy Project," (PowerPoint, 2016).

[12] "Fort Hood Activates Solar Energy System at Liberty Village Military Housing," SCHOTT North America, March 27, 2012, http://www.us.schott.com/english/news/press.html?NID=us441; Christine Luciano, "Fort Hood Turns on Solar Field, Generates Renewable Energy," The United States Army, March 29, 2012, https://www.army.mil/article/76848/Fort_Hood_turns_on_solar_field__generates_renewable_energy.

[13] Staff, "Fort Hood Gets Solar, Wind Farms in Army's Largest Energy Project," Army Times, January 28, 2016, http://www.armytimes.com/story/military/2016/01/28/fort-hood-gets-solar-wind-farms-armys-largest-energy-project/79482582/.

[14] Clifford K. Ho and Cianan A. Sims, Solar Glare Hazard Analysis Tool (SGHAT) User's Manual v. 2.0 (Sandia National Laboratories, August 23, 2013).

[15] Roger Colton, "Assessing Solar PV Glare In Dense Residential Neighborhoods," Solar Industry, January 2015, http://solarindustrymag.com/online/issues/SI1501/FEAT_02_Assessing-Solar-PV-Glare-In-Dense-Residential-Neighborhoods.html.

[16] "Concentrating Solar Power Projects," National Renewable Energy Laboratory, accessed August 4, 2016, http://www.nrel.gov/csp/solarpaces/by_country_detail.cfm/country=US;
Solar Energy Industries Association, Major Solar Projects in the United States Operating, Under Construction, or Under Development.

[17] Tetra Tech EC, Inc. and Nixon Peabody, LLC, Wind Energy Siting Handbook, 2008.

[18] State Energy Conservation Office, Texas Renewable Energy Resource Assessment, 2008, http://www.seco.cpa.state.tx.us/publications/renewenergy/.

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[23] Office of the Governor Economic Development and Tourism Business Research, The Texas Renewable Energy Industry, 2014, http://gov.texas.gov/files/ecodev/Renewable_Energy.pdf.

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[25] Federal Aviation Administration, "Digital Vertical Obstruction File," 2015.

[26] Department of Energy, "Texas Wind Resource Map and Potential Wind Capacity," Texas Wind Resource Map and Potential Wind Capacity, September 24, 2015, http://apps2.eere.energy.gov/wind/windexchange/wind_resource_maps.asp?stateab=tx.

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[28] Mark McLaughlin, "Wind Farm Effects on Air Traffic Control and Compatible Siting Collaboration," (32 PowerPoint Slides, 2011), http://growinggreencommunities.com.ismmedia.com/ISM3/std-content/repos/Top/Text%20Blocks/Speakers/Presentations/AP/AP%20McLaughlin.pdf.

[29] Federal Aviation Administration, "Digital Vertical Obstruction File."

[30] Electric Reliability Council of Texas, Generator Interconnection Status Report.

[31] Federal Aviation Administration, "Digital Vertical Obstruction File."

2.6.4 AIR AND WATER QUALITY

Per Army Regulation 200-1, Environmental Protection and Enhancement, "All Army organizations and activities will comply with legally applicable Federal, State, and local regulations, executive orders (EOs), and FGS to conserve, protect and restore surface water resources (including wetlands, estuaries, streams, lakes and so forth), and groundwater (wells and aquifers)." With respect to air, the Army shall "Comply with applicable Federal, State and local air quality regulations, permit requirements, and overseas Final Governing Standards (FGS)." [1]

AIR QUALITY OVERVIEW

Air Quality for the region is regulated by provisions of the Clean Air Act and Clean Air Act Amendments as implemented by the United States Environmental Protection Agency (EPA) and through the Texas Commission on Environmental Quality (TCEQ) air pollution control program. The Clean Air Act standards for Fort Hood are also implemented into Army Regulation 200-1 and Fort Hood Regulation 200-1.[2] Fort Hood falls under the jurisdiction of the air programs administered by EPA Region 6 (Dallas) and TCEQ Region 9 (Waco). Fort Hood's air quality program ensures that the installation's air emission sources comply with all applicable federal, state, and local air regulations. Fort Hood sources of air pollution are:[3]

- Abrasive Cleaning
- Asphalt Operations
- Above Ground Storage Tanks
- Miscellaneous Chemical Usage
- Cooling Towers
- Degreasing/Solvent Cleaning
- External Combustion
- Fuel Dispensing
- Fire Training/Prescribed Burning
- Fuel Loading
- Internal Combustion
- Landfills
- Munitions
- Open Burning/Open Detonation
- Ozone Depleting Chemicals
- Herbicide/Pesticide Application
- Remediation
- Roads
- Sealants/Adhesives
- Spills/Releases
- Surface Coating Operations
- Underground Storage Tanks
- Welding/Soldering/Cutting
- Woodworking
- Waste Solvent and Fuel Reclamation
- Waste Water Treatment

In October 2015, EPA revised the primary and secondary National Ambient Air Quality Standards (NAAQS) for ozone to 70 parts per billion (ppb).[4]

The latest three-year average (2013 – 2015) for the Killeen monitor is 69 parts per billion (ppb).[5] Under newly-published standards, the maximum permitted concentration is 70 ppb and is currently classified as "attainment" areas under the NAAQS. If the data shows an average higher than 70 ppb for an identified area, the area may be designated as "Non-Attainment" for ozone

and a plan must be developed to return to compliance. A recent study suggests that a non-attainment designation for the EPA's proposed ozone NAAQS could cost the Central Texas economy $24 - $41 billion between 2018 and 2046. On an annual basis, that would be $0.9 - $1.4 billion per year.[6]

WATER OVERVIEW

CURRENT WATER SOURCING

Fort Hood's water can be classified into two main categories—groundwater and surface water. Surface water is the primary source of water used at Fort Hood and includes the municipal water supply, training activities, recreation, vehicle maintenance and aquatic habitat.

SURFACE WATER

Around Fort Hood, surface water resources consist of numerous small to moderate sized streams. There are approximately 200 miles of named intermittent and perennial streams on the installation than span across six large watersheds (Leon River, Owl Creek, Cowhouse Creek, Belton Lake, Nolan Creek, and Lampasas River), and several smaller subwatersheds. Fort Hood contains more than 200 water impoundments that span approximately 692 surface-acres; the impoundments are used primarily for flood control, sediment retention, water for wildlife and livestock, fish habitat and military training activities.

Fort Hood is located directly upstream of two man-made reservoirs: Belton Lake (the sole source water supply for 200,000 people in Fort Hood and the surrounding communities) and Stillhouse Hollow Lake (the water supply for several surrounding communities). Both reservoirs also provide recreational opportunities, flood control and wildlife habitat for the region.

GROUNDWATER

The Trinity aquifer, one of the most extensive and highly used groundwater resources in Texas, is the major aquifer that underlies the JLUS focus area; the Trinity Aquifer extends through central Texas and underlies parts of 55 counties. The aquifers recharged by sensitive groundwater areas near Fort Hood are shallow and could be impacted by hazardous material spills and seepage. However, as groundwater studies at Fort Hood have shown, no major groundwater resources outside the installation are affected by recharge from within Fort Hood, and there are no critical groundwater issues directly attributed to the installation.

MEETING FUTURE DEMANDS

The City of Killeen currently projects a water surplus through 2070. Gatesville obtains its water supply from Lake Belton via a contract with the Brazos River Authority. Currently water shortages are projected for 2040 and 2070. The city has developed a series of strategies to meet the projected water shortages for the City of Gatesville ranging from conservation to water purchase. Fort Hood has a water right to store and divert 12,000 acre ft/yr in Lake

Belton. Bell County WCID No. 1 and City of Gatesville divert, treat and deliver its Lake Belton supply to the Army base. No shortages are projected for Fort Hood through 2070 and no changes in water supply were recommended under the 2016 Brazos G Regional Water Plan. [7]

The proposed Coryell County Off-Channel Reservoir (OCR) is a proposed new reservoir on a tributary adjacent to Cowhouse Creek and would provide water for projected future shortages in the region.[8] In addition, many aquifers in Texas, including the Trinity aquifer, contain a large volume of brackish groundwater for which desalination may be feasible to help meet increasing demand for potable water. However, brackish groundwater desalination projects are greatly hampered by brackish groundwater depth and concentrate disposal. [9]

STORMWATER

Currently, Fort Hood operates industrial, construction, and municipal storm water programs, while the American Water's Military Services Group owns and operates water and wastewater utilities under the Utilities Privatization program for Fort Hood.[10] Fort Hood is required to comply with the rules and regulations established in Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code. Types of Pollutants that may impact storm water at Fort Hood include: [11]

- Motor Oil and other POL products
- Mop Bucket Wash Water
- Yard Clippings
- Animal Waste
- Fertilizers and Pesticides
- Soapy Car Wash Water
- Construction Site Eroded Sediment
- Litter

Fort Hood's Municipal Storm Water Program ensures the Installation complies with all federal, state and local storm water regulations. Fort Hood currently monitors 32 industrial sites covered in the Multi-Sector General Permit TXR05000. Sites are monitored annually and/or semi-annually. Typical pollutants sampled are heavy metals, TSS, and chemical oxygen demand (COD). Site specific pollutants are determined by the type of operation. Most sites meet regulatory requirements; however, several sites have a history of exceeding permit benchmark parameters for COD and/or zinc. [12]

Various activities at Fort Hood might contribute sediment and other nonpoint source pollutants to nearby water bodies and groundwater. Storm water runoff from training areas could carry sediments, vehicle fluids, and metals, as well as phosphorus and toxics contained within munitions. Surface water quality might also be affected by runoff from agricultural operations in the agriculture outlease areas of the installation. The runoff might contain nonpoint source pollution such as pesticides, sediment, fertilizers, animal waste, and oil and grease.[13] The U.S. Army Center for Health Promotion and Preventive

Medicine has conducted studies to investigate the presence of explosive residues and metals in groundwater, surface water and sediment in and around Fort Hood; the Cowhouse Creek basin captures both runoff and shallow groundwater flow from the impact area and empties into Belton Lake. Explosives or degradates were all below detection limits in surface water and sediment samples. In addition, perchlorate was not detected in any surface water samples. These results do not demonstrate evidence of groundwater contamination.[14]

Sanitary sewer overflows have been noted as a potential source of contamination to water resources on Fort Hood. There are records of sanitary sewer overflows across the cantonment, specifically near Clear Creek (near the golf course and along tributaries) and near Nolan Creek. In the past, it was estimated that on average approximately 50,000 to 100,000 gallons of raw sewage flowed into water resources each year due to overflows; in 2009 sanitary sewer overflows resulting in an estimated release of 571,400 gallons of raw sewage, some of which entered surface waters. These overflows can pose an issue regarding water resources, potentially resulting in fish kills or other health issues. Other possible wastewater issues include releases related to portable latrines, mobile kitchens and showers, and handwashers used across the installation. While procedures are followed to minimize pollution from these temporary uses, it remains unknown what impact, if any, these might have on the water resources at Fort Hood and the surrounding region. [15]

Fort Hood has implemented a Storm Water Management Plan (SWMP) to reduce the discharge of pollutants to the maximum requirements of their general permit. To address this, Fort Hood's SWMP sets forth the following key strategies:

- public Education and Outreach,
- public Involvement/Participation,
- illicit Discharge Detection and Elimination,
- pollution Prevention/Good Housekeeping for Municipal Operations,
- construction Site Storm Water Runoff Control, and
- post-construction Storm Water Management in New Development and Redevelopment.

AIR AND WATER QUALITY SUMMARY

The only significant issue related to air or water quality encroachment is the region's ability to maintain compliance with stricter EPA ozone standards. This is an area-wide concern that will require concerted efforts by all communities and Fort Hood to work together to avoid non-attainment status and the associated costs and restrictions.

AIR AND WATER QUALITY FOOTNOTES

[1] Headquarters Department of the Army, "Environmental Protection and Enhancement."
[2] Ibid.; Department of the Army, "III Corps & Fort Hood Regulation 200-1: Environment and Natural Resources."
[3] Directorate of Public Works, "Permits."
[4] Environmental Protection Agency, "40 CFR Part 50, 51, 52, et Al.: National Ambient Air Quality Standards for Ozone; Final Rule."
[5] Killeen-Temple Metropolitan Planning Organization, "Air Quality."

[6] Capital Area Council of Governments Air Quality Program, "The Potential Costs of an Ozone Nonattainment Designation to Central Texas."
[7] Texas Water Development Board, "2016 Brazos G Regional Water Plan Volume I: Executive Summary and Regional Water Plan."
[8] Texas Water Development Board, "2016 Brazos G Regional Water Plan Volume II: Identification, Evaluation, and Selection of Water Management Strategies."
[9] Ibid.
[10] American Water Military Services, "2015 Annual Water Quality Report."
[11] Directorate of Public Works, "Municipal Storm Water Program."
[12] Ibid.
[13] Ibid.
[14] Ibid.
[15] Ibid.

FORT HOOD PROFILE
SECTION THREE

FORT HOOD PROFILE

3.1 OVERVIEW

Fort Hood is located in central Texas, straddling both Bell and Coryell Counties, approximately 60 miles north of Austin and 40 miles southwest of Waco. Food Hood is bounded on the east by the City of Belton and Belton Lake, the south by the cities of Killeen and Harker Heights, the west by the City of Copperas Cove, and the north by the City of Gatesville. The installation has three separate cantonment areas (designated the Main Cantonment Area,West Fort Hood, and North Fort Hood) on 8,604 acres. The Main Cantonment Area is at the southern edge of the large, central portion of the installation and is adjacent to Killeen. West Fort Hood cantonment area is near Copperas Cove, in the center of the southern extension of the installation. North Fort Hood cantonment area is near Gatesville, in the northernmost part of the installation. (Fort Hood IONMP 2012)

3.2 HISTORY

On 14 January 1942, the U.S. War department announced the selection of Killeen as the site for the Tank Destroyer Tactical and Firing Center. The Army selected a site near Old Fort Gates, a frontier post established in 1849. Located just north of the small farming and ranching community of Killeen, the new base, Camp Hood, encompassed portions of Bell and Coryell Counties. Camp Hood was named in honor of the famous Confederate General, John Bell Hood, in February 1942. The original camp consisted of 108,000 acres of open fields, wooded area, slopes and sharply cut stream lines. Extending the reservation to the south eight miles from the Atchison, Topeka, and Santa Fe Railroad and to the north five miles southeast of Gatesville brought the total size by 1943 to approximately 160,000 acres.

The main cantonment area was constructed immediately west of Killeen, followed by a second cantonment area 17 miles to the north. The names South and North Camp Hood were used to distinguish between the two. Camp Hood's mission was changed from a tank destroyer training area to an infantry training center in 1944. On April 15, 1950, Camp Hood became a permanent installation and was re-designated Fort Hood. The acquisition of almost 50,000 additional acres in 1954 brought Fort Hood to its current size of 218,410 acres or about 335 square miles. Today, Fort Hood has nearly 38,500 soldiers and remains one of the largest Army installations for tactical troops in the United States. (Fort Hood IONMP 2012)

3.3 FORT HOOD MISSION FOOTPRINT

Fort Hood is the home of III Armored Corps, the 1st Cavalry Division, the 3rd Cavalry Regiment and First Army Division West, along with a wide range of other combat, combat support and combat service support units from the Active, Reserve and National Guard components of the US Army as well as other branches of the military. As a combat training focused installation, Fort Hood has significant assets to provide units with a wide range of realistic training on one of the largest installations

in the Army. The following details both the training assets and the extent of the impacts that have been identified as being associated with the operations that take place at Fort Hood, including both ground and air operations.

3.3.1 GROUND OPERATIONS

Ground operations, including training by armor, infantry and artillery units, is conducted on the ranges and training areas that occupy the vast majority of Fort Hood (See Map 3.1). While the ranges on the installation are focused toward the center of the post, training areas that can accommodate large scale maneuver training extend to each boundary of the post, with the only exceptions being in the vicinity of the Main Cantonment area and Robert Gray Army Airfield.

MANEUVER TRAINING

The training areas on the installation are further divided between areas that can accommodate heavy forces (armored units) and light forces (dismounted infantry and wheeled vehicles) as shown in Map 3.2. Of particular note, the map demonstrates the significant amount of continuous area available to armored forces for maneuver training along the western portion of the installation. The map further demonstrates the presence of maneuver area available to armored forces in close proximity to the urbanized areas of Killeen, Harker Heights and Nolanville along the installation's southern boundary, just east of the Main Cantonment Area. Training areas available only to light forces occupy areas primarily in the eastern portion of the installation and around Robert Gray AAF, where terrain and other limitations make the areas unsuitable for armored vehicles.

WEAPONS TRAINING HAZARD AREAS

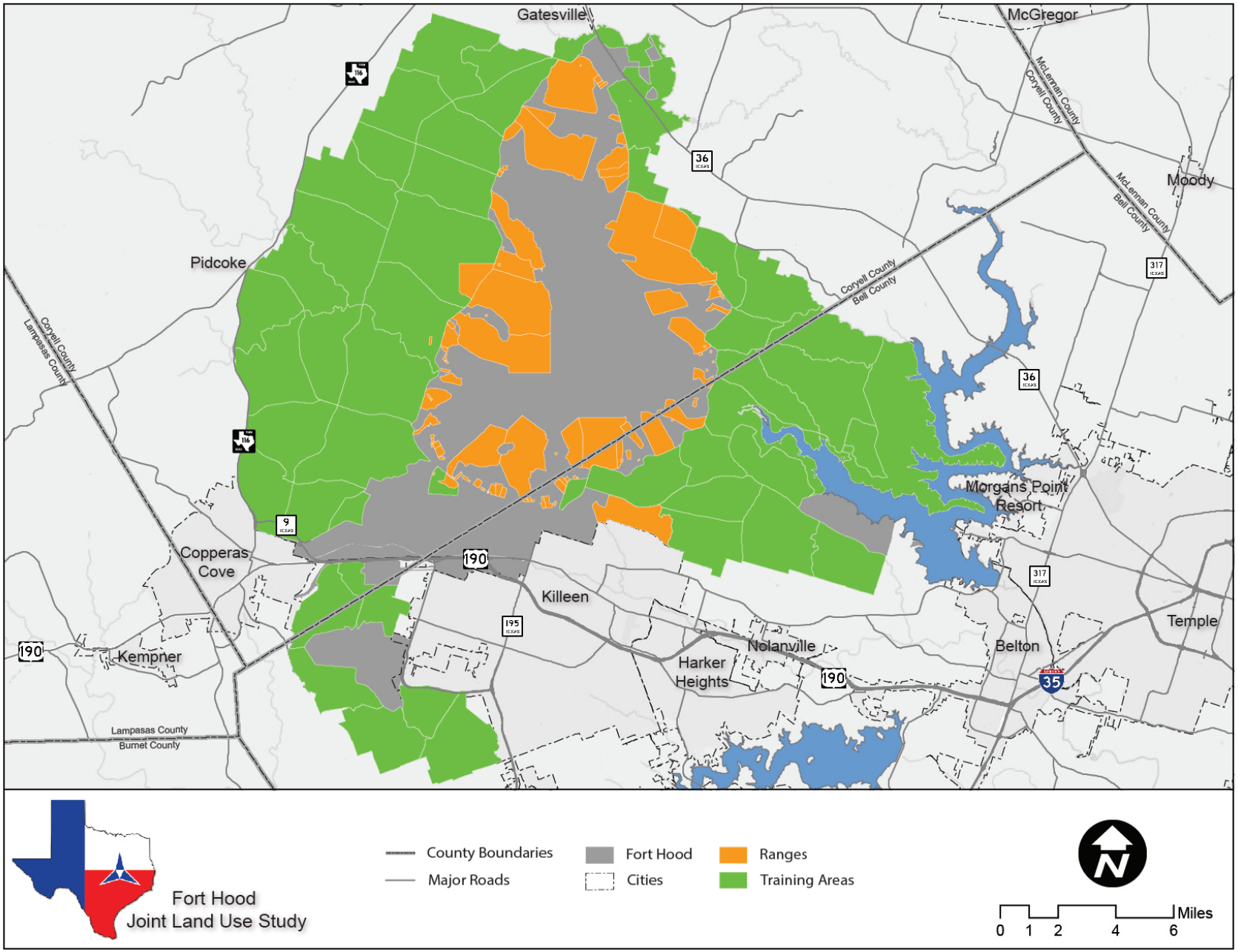
Live fire weapons training occurs primarily on the ranges located at the center of Fort Hood. Map 3.3 details the hazard areas associated with the ranges, including the impact areas, the dudded impact areas and the surface danger zones. As the map demonstrates, all known hazards are confined within the boundaries of the installation.

SMALL ARMS NOISE

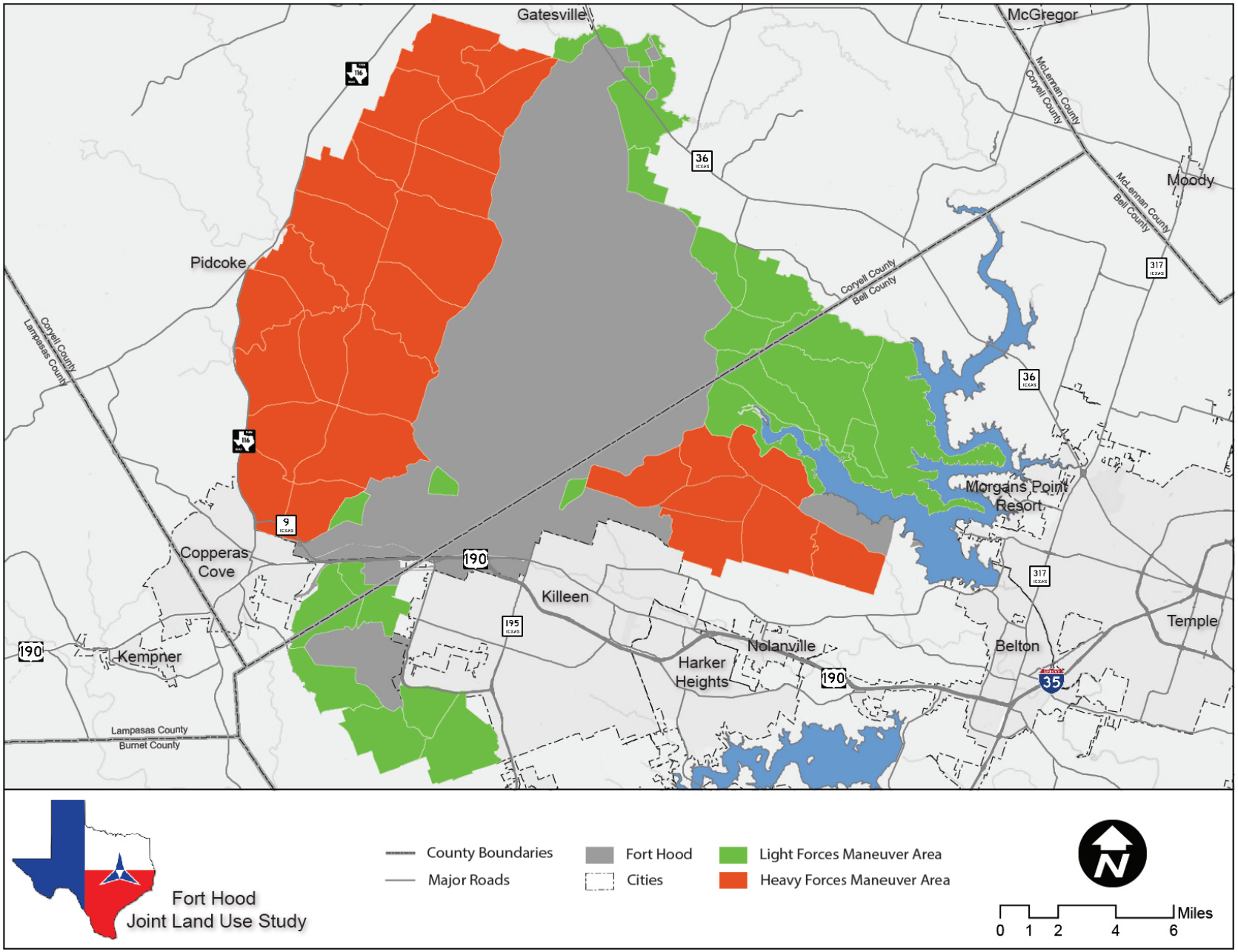
The noise zones associated with fixed firing point small arms ranges is shown in Map 3.4. As the map demonstrates, the majority of the high noise levels generated from such training on Fort Hood remains on the installation, with only slightly more than 300 acres of the 87-104 dB PK15 noise zone falling outside of the installation along its northeastern boundary.

In addition to the noise generated at the fixed firing point small arms ranges on Fort Hood, the Installation Operational Noise Management Plan identified two areas where noise from small arms fire from training that occurs on ranges and training areas where small arms fire is allowed at variable points potentially extends off the installation. These two locations, Phantom Run Range and TA-40 are both located along the southern boundary

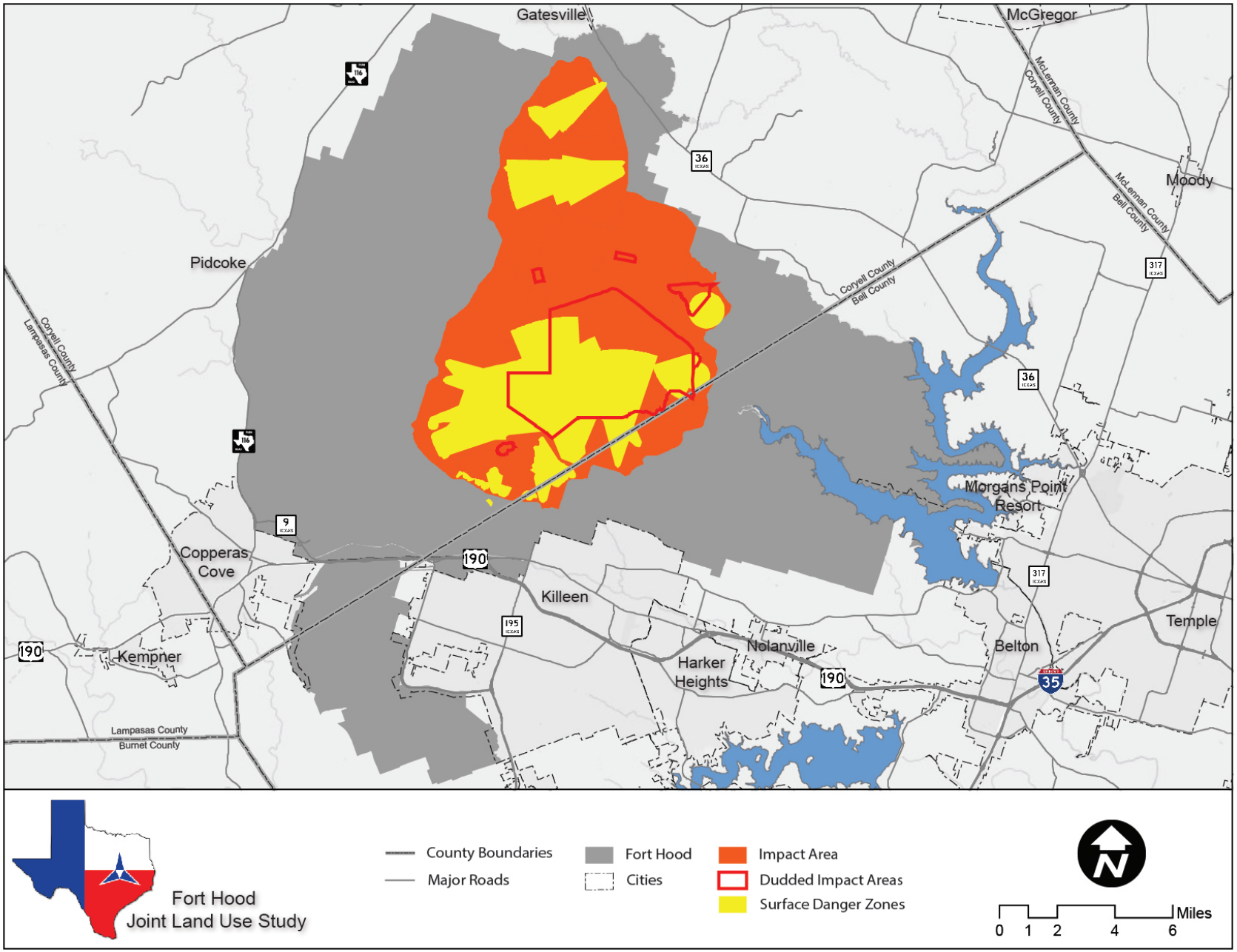
▼ MAP 3.1 FORT HOOD GENERALIZED TRAINING AREA



▼ MAP 3.2 FORCES MANEUVER AREAS



▼ MAP 3.3 IMPACT AREAS AND SURFACE DANGER ZONES



of the installation. Map 3.5 details the extent of the potential noise impact in these two areas. The total potential area of impact from noise associated with Phantom Run Range is just under 200 acres in the highest (104+ dB PK15) noise zone, and approximately 650 acres in the lower (87-104 dB) noise zone. The potential noise impact from TA-40 is much smaller, with only around 30 acres in the 104+ dB noise zone and 250 acres of the 87 dB noise zone falling outside of the installation.

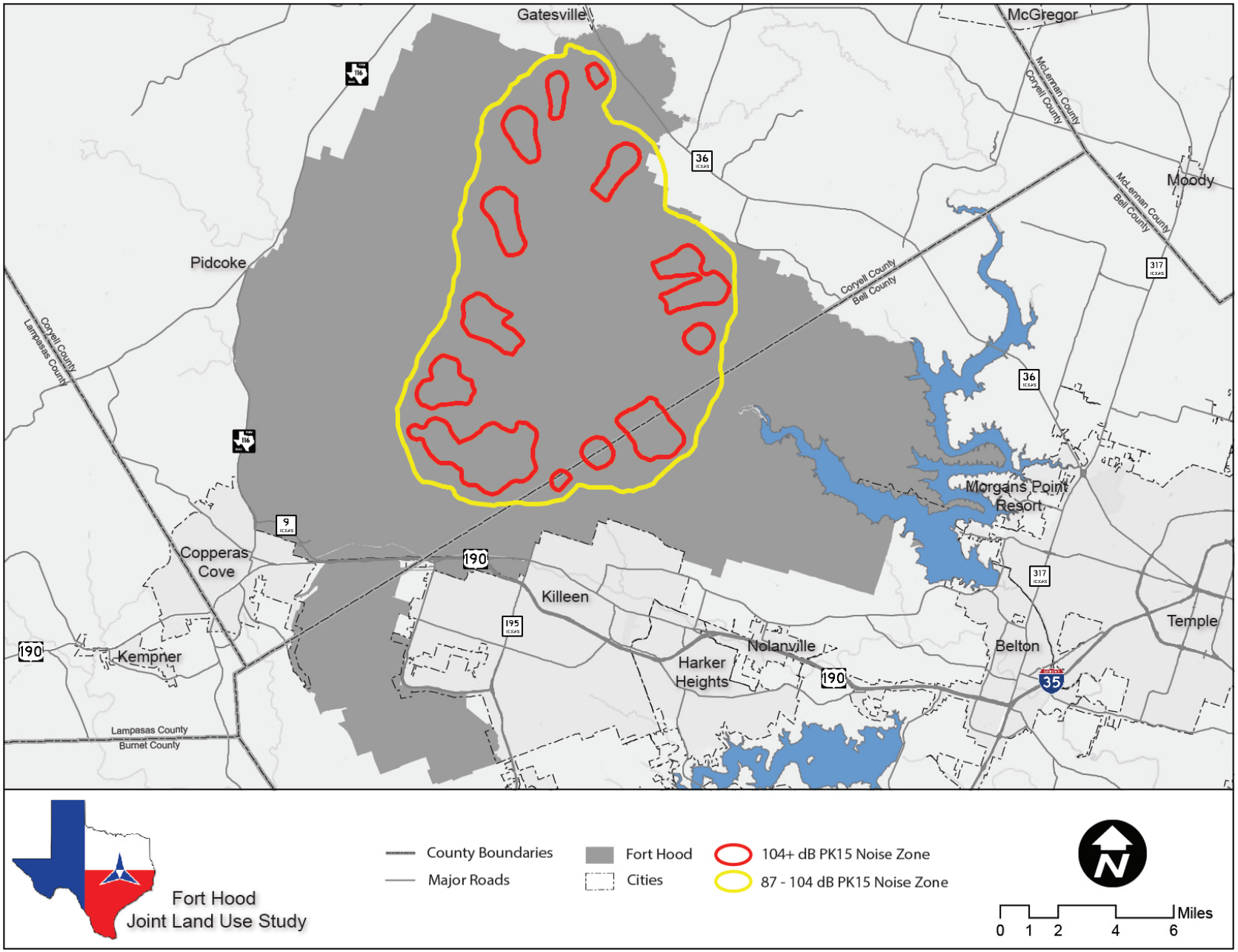
LARGE CALIBER WEAPONS NOISE

The peak noise contours associated with the firing of weapons systems larger than 20mm extend across Fort Hood, virtually covering the installation. The noise contours depicted on Map 3.6 correlate to a degree of "complaint risk" associated with the particular noise level. The majority of the highest peak noise contour (130 dB+ PK15 "high complaint risk") falls inside of the installation boundary, with just under 1,100 acres extending past the northern installation boundary. A much larger portion of the noise zone associated with a "moderate complaint risk" (115 dB PK15) extends outside of the installation, covering just under 17,700 acres of land, primarily along the northern boundary of the installation, but also including smaller areas along the western and southern boundaries.

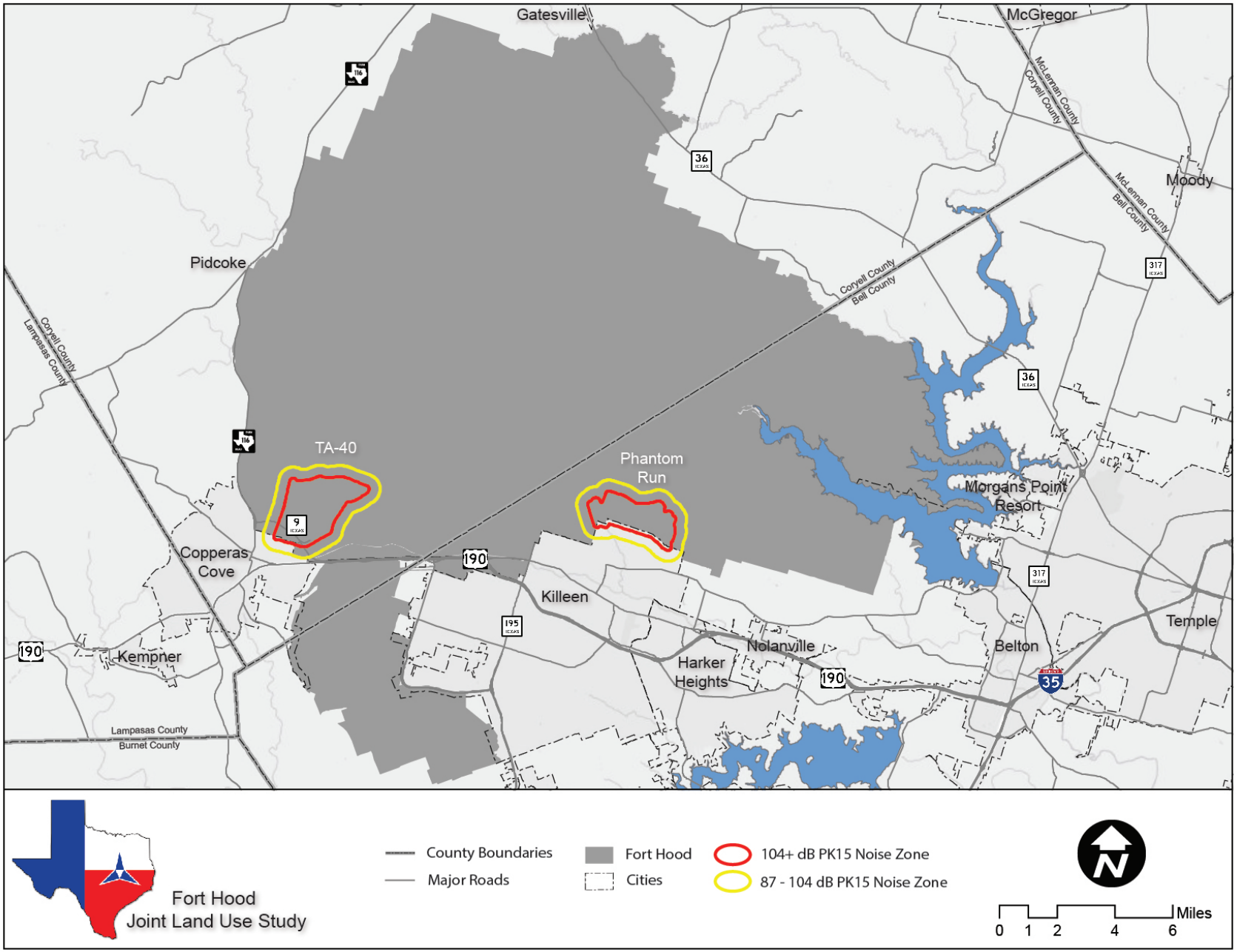
AMMUNITION STORAGE SAFETY ZONES

Ammunition storage areas on the installation range from hardened permanent storage facilities to locations in the field that are designated for temporary ammunition storage and transfer. Associated with each of these locations on the installation are what are known as "quantity distance arcs," which are essentially explosive hazard areas that are sized in a manner to correspond with the amount of ammunition that is permitted to be stored in the particular location. Map 3.7 details the location of the safety zones, which are shown to fall entirely within the boundaries of the installation.

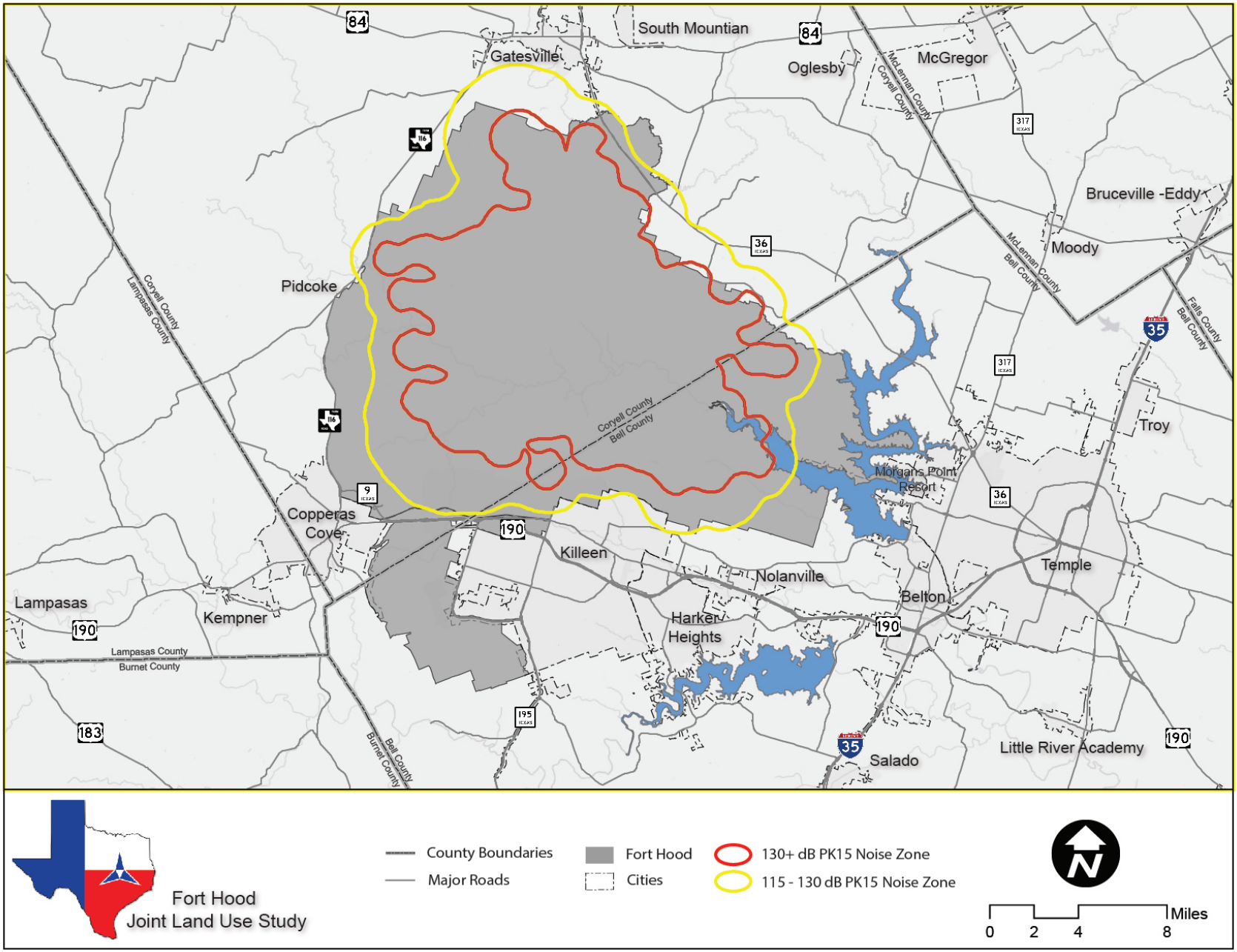
▼ MAP 3.4 SMALL ARMS NOISE ZONES



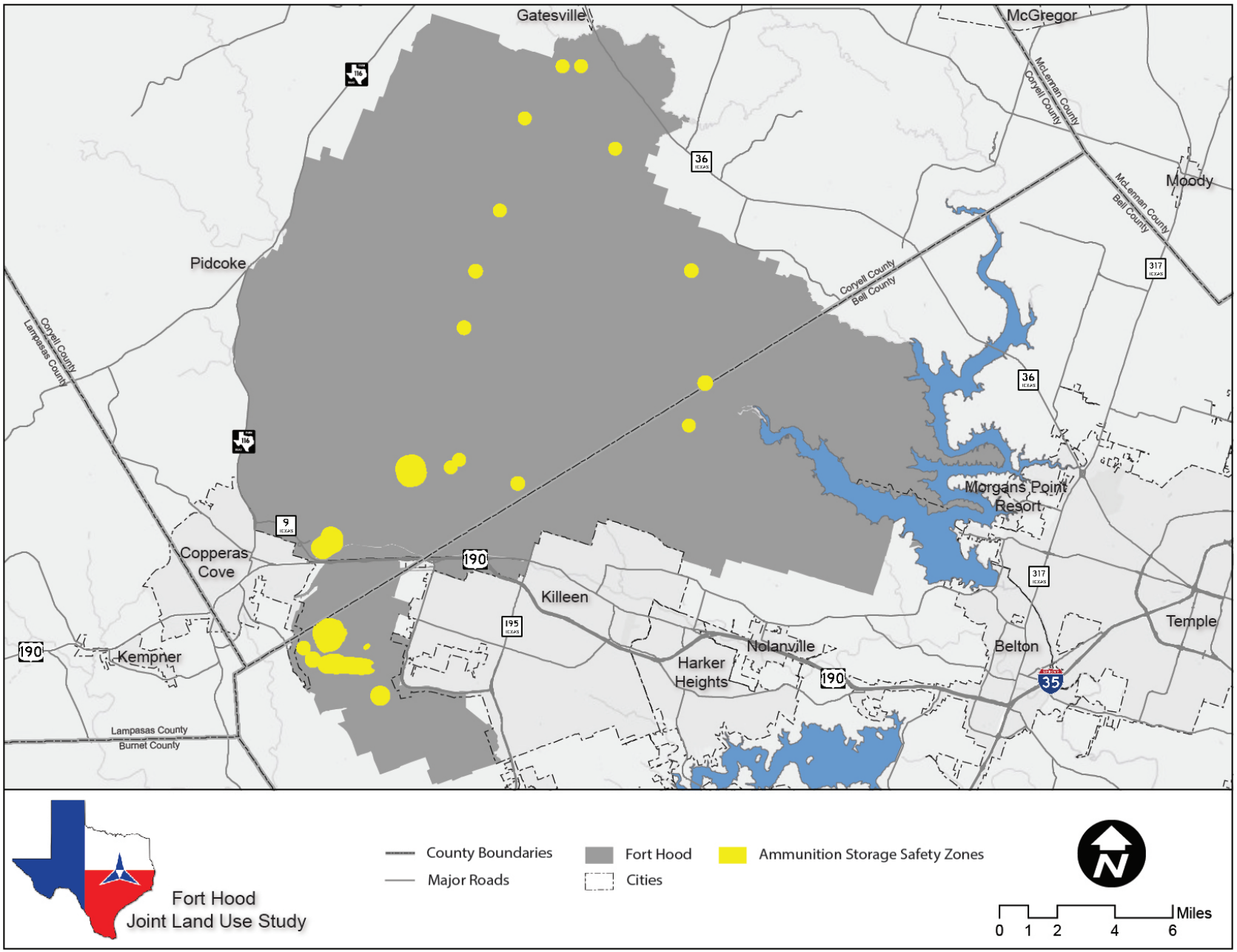
▼ MAP 3.5 TA-40 AND PHANTOM RUN SMALL ARMS NOISE CONTOURS



▼ MAP 3.6 LARGE CALIBER NOISE ZONES



▼ MAP 3.7 AMMUNITION STORAGE SAFETY ZONES



3.3.2 AVIATION OPERATIONS

Unlike training for ground operations, aviation related training requires a larger overall area for operational training than is immediately available over Fort Hood, essentially requiring that aviation units utilize shared airspace outside of the installation on a regular basis to conduct training. Map 3.8 focuses on the local aviation training routes and airspace available for operations over and in close proximity to the installation. The restricted area over Fort Hood is controlled airspace that is exclusive to the installation, while the Hood and Gray MOAs (Military Operations Areas) are available for military training activities, however, civilian aircraft are not prohibited from entering these areas.

Outside of the immediate vicinity of the installation, Map 3.9 details the extent of the training routes that are in regular use by aviation units at Fort Hood and other regionally available special use airspace (MOAs). This area, collectively known as the Western Training Area, is not subject to Army or DoD jurisdiction, and despite the presence of special use airspace in its vicinity, there is no formal designation of the area by the FAA outside of the Brady, Brownwood and Laughlin MOAs, which cover only small portions of the training area.

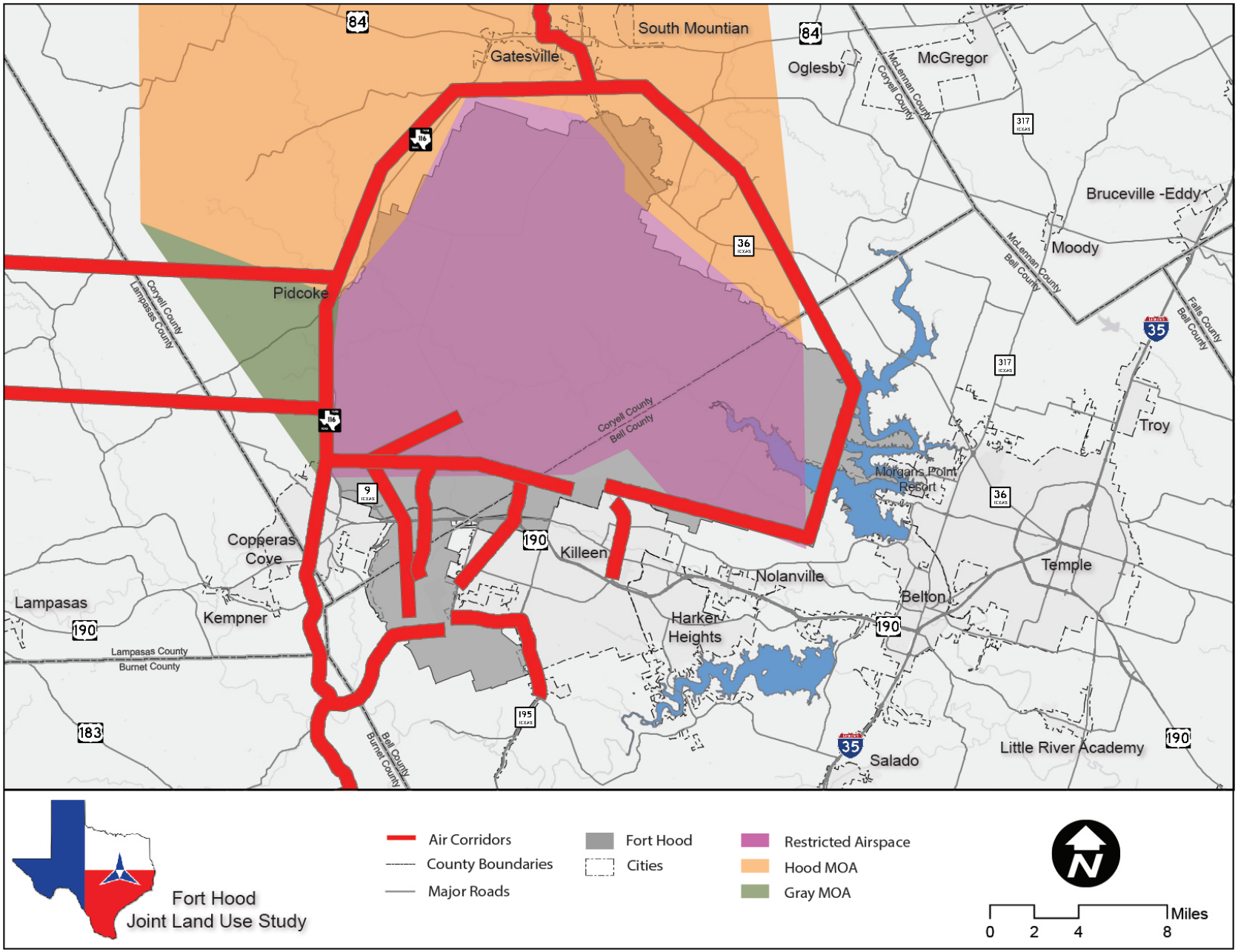
AIRFIELDS AND LANDING STRIPS

Aviation operations at Fort Hood are conducted primarily from the two airfields and two auxiliary landing strips shown in Map 3.10. Robert Gray AAF is the primary aviation facility on the installation, and also serves as the regional commercial airport for Killeen and the surrounding area. With a 10,000 foot runway, Robert Gray AAF is capable of landing all US Air Force airlift aircraft that could be employed in a mobilization from the installation. Hood AAF is the primary rotary wing aviation site on Fort Hood and hosts most of the active component aviation assets on the installation. The Shorthorn and Longhorn auxiliary landing strips at North Fort Hood are primarily utilized for reserve component mobilization training, and lack many of the permanent facilities at the two primary airfields on the post, but nevertheless are critical aviation assets and have the capacity to conduct significant flight operations and host large numbers of rotary wing aircraft.

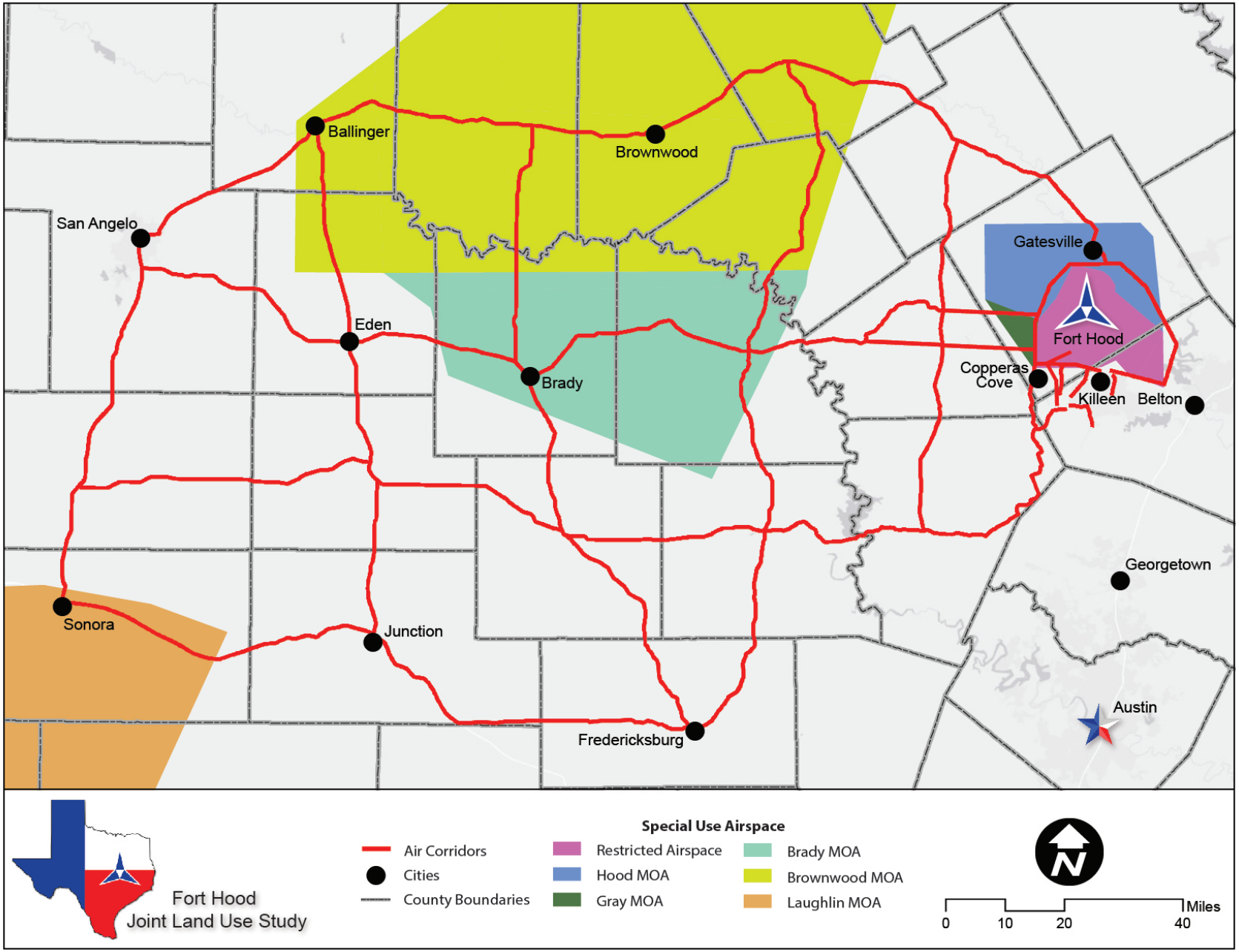
AIRCRAFT ACCIDENT POTENTIAL

The potential for aircraft accidents is generally highest in closest proximity to a runway as most aviation mishaps are related to takeoff and landing. The Unified Facilities Criteria for Airfield and Heliport Planning and Design establishes a series of zones, varying in size based on the type of runway, that are intended to indicate the degree of risk associated with the hazards of aviation in those areas. Map 3.11 details the location of the accident potential zones associated with Robert Gray AAF and Hood AAF. As the map indicates, the nature of the facilities and operations occurring at Robert Gray AAF require a larger set of accident potential zones, while those associated with Hood AAF are much smaller, primarily due to the length of the runway and

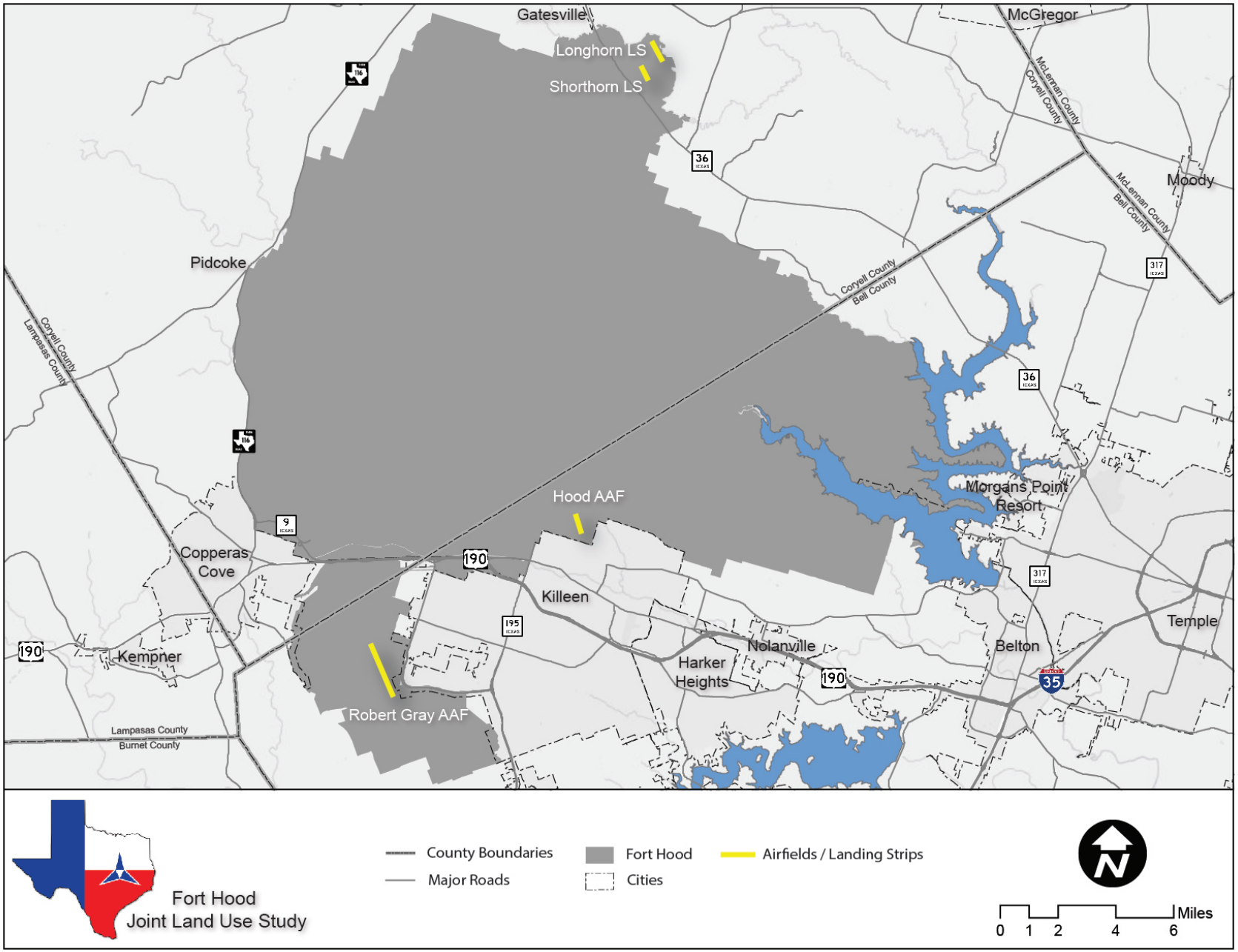
▼ MAP 3.8 AVIATION OPERATIONAL AREAS



▼ MAP 3.9 WESTERN TRAINING AREA AVIATION OPERATIONAL AREAS



▼ MAP 3.10 MILITARY AIRFIELDS



primary use as a heliport. As the map also demonstrates, the entire area of Hood AAF's accident potential zones are on the installation, while all but 175 acres of the lowest risk APZ associated with Robert Gray AAF are contained on the installation. It should be noted that despite the "improved" nature of Shorthorn and Longhorn Auxiliary Landing Strips, accident potential zones have not been established for their runways.

APPROACH AND DEPARTURE ZONES

While the accident potential zones discussed previously are primarily intended to assist in limiting risk to lives and property on the ground, the FAA, in 14 CFR Part 77, establishes standards that are intended to limit the construction of or presence of anything that might pose a hazard to air navigation in the vicinity of an airport. Map 3.12 details the "imaginary surfaces" associated with the approach/departures zones leading to the runways at Robert Gray AAF and Hood AAF. These surfaces, which slope toward the runway along the approach and departure routes, establish an altitude above which, penetrations by anything that might pose a hazard to air navigation are strongly discouraged (and often prohibited by local airport zoning regulations). As the map shows, the imaginary surfaces associated with the two primary airfields extend well of the installation over the surrounding communities along the axes of the runways at the airfields.

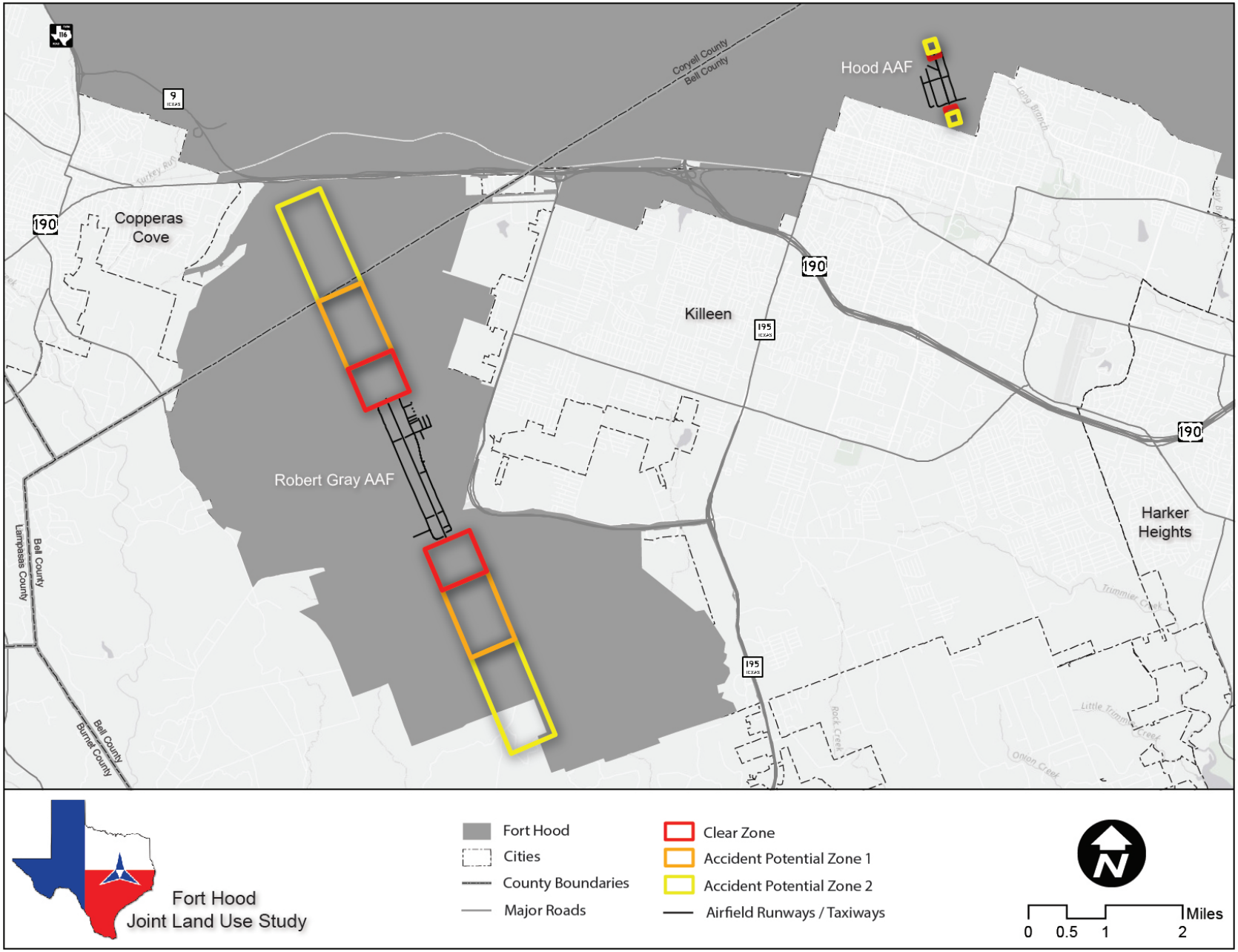
AVIATION NOISE

Data for noise zones associated with aviation operations at Fort Hood has only been established for Robert Gray AAF, although prior noise studies of the installation did indicate the presence of noise contours for Hood AAF, although the Hood AAF noise zones were confined entirely within the installation boundary. Map 3.13 details the current extent of the Robert Gray AAF noise zones. As the map shows, the highest noise contour, which is associated with noise levels greater than 75 dBA (aviation weighted noise level) is confined on Fort Hood, while only a small portion of the lower noise zone (65-75 dBA) falls outside of the installation boundary, covering approximately 200 acre of land. These noise contours, like all others in this study, are not intended to imply that the noise from any particular event may not extend into and area not covered by a noise contour. Rather, they are intended to establish the most common or concentrated areas of noise generated by the various training and operational activities at Fort Hood.

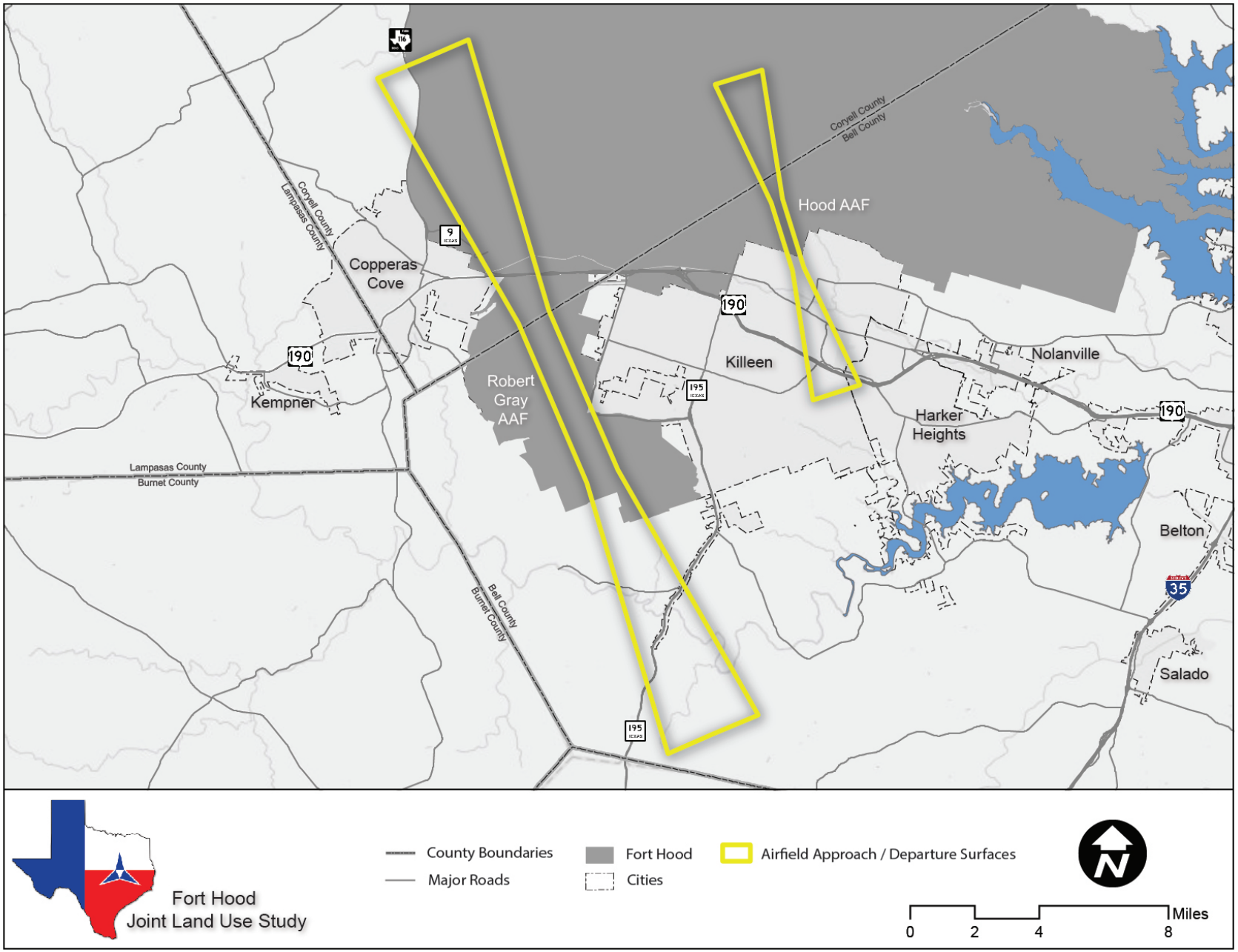
UNMANNED AIRCRAFT SYSTEMS (UAS)

A wide range of units on Fort Hood are involved in the operation of unmanned aircraft systems. The larger of these aircraft operate from Robert Gray AAF, and because of their nature, they are subject to more intensive regulation by the Army in terms of where they can fly. Until recently, operations have only been authorized over airspace above Fort Hood. Map 3.14 demonstrates the narrow path that UAS operators are required

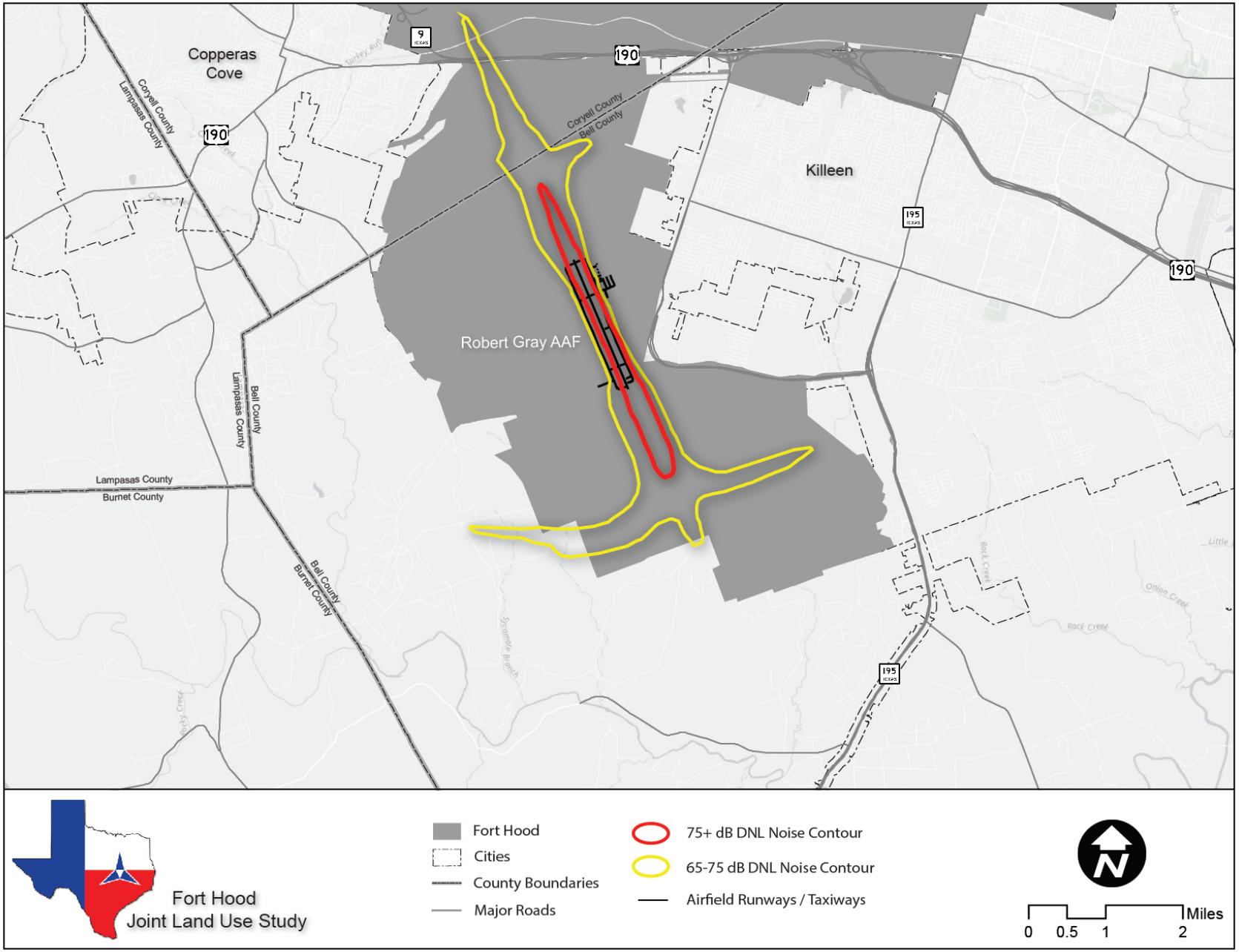
▼ MAP 3.11 AIRFIELD ACCIDENT POTENTIAL ZONES



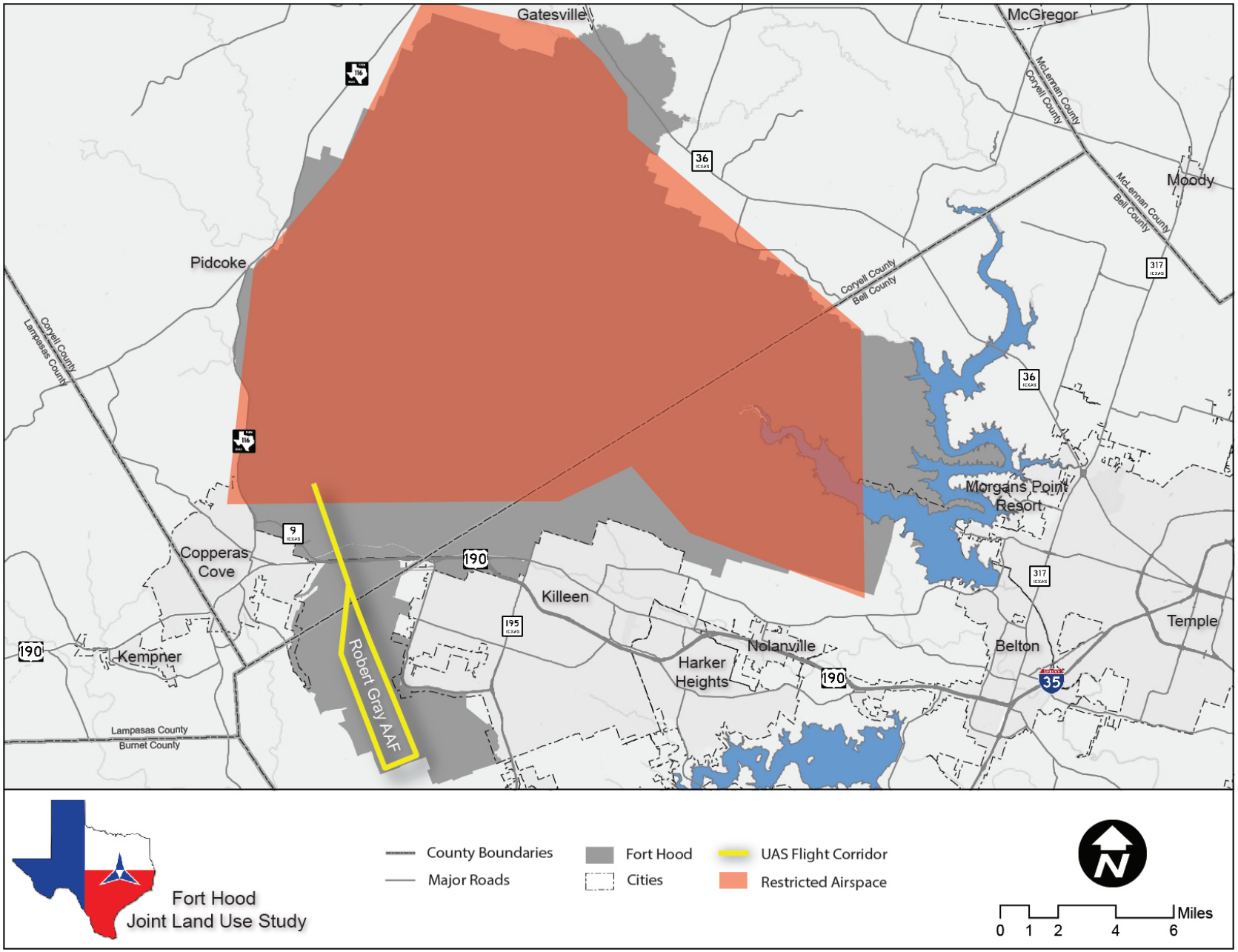
▼ MAP 3.12 AIRFIELD APPROACH AND DEPARTURE ZONES



▼ MAP 3.13 ROBERT GRAY ARMY AIRFIELD NOISE CONTOURS



▼ MAP 3.14 FORT HOOD RESTRICTED AIRSPACE AND UAS FLIGHT CORRIDOR

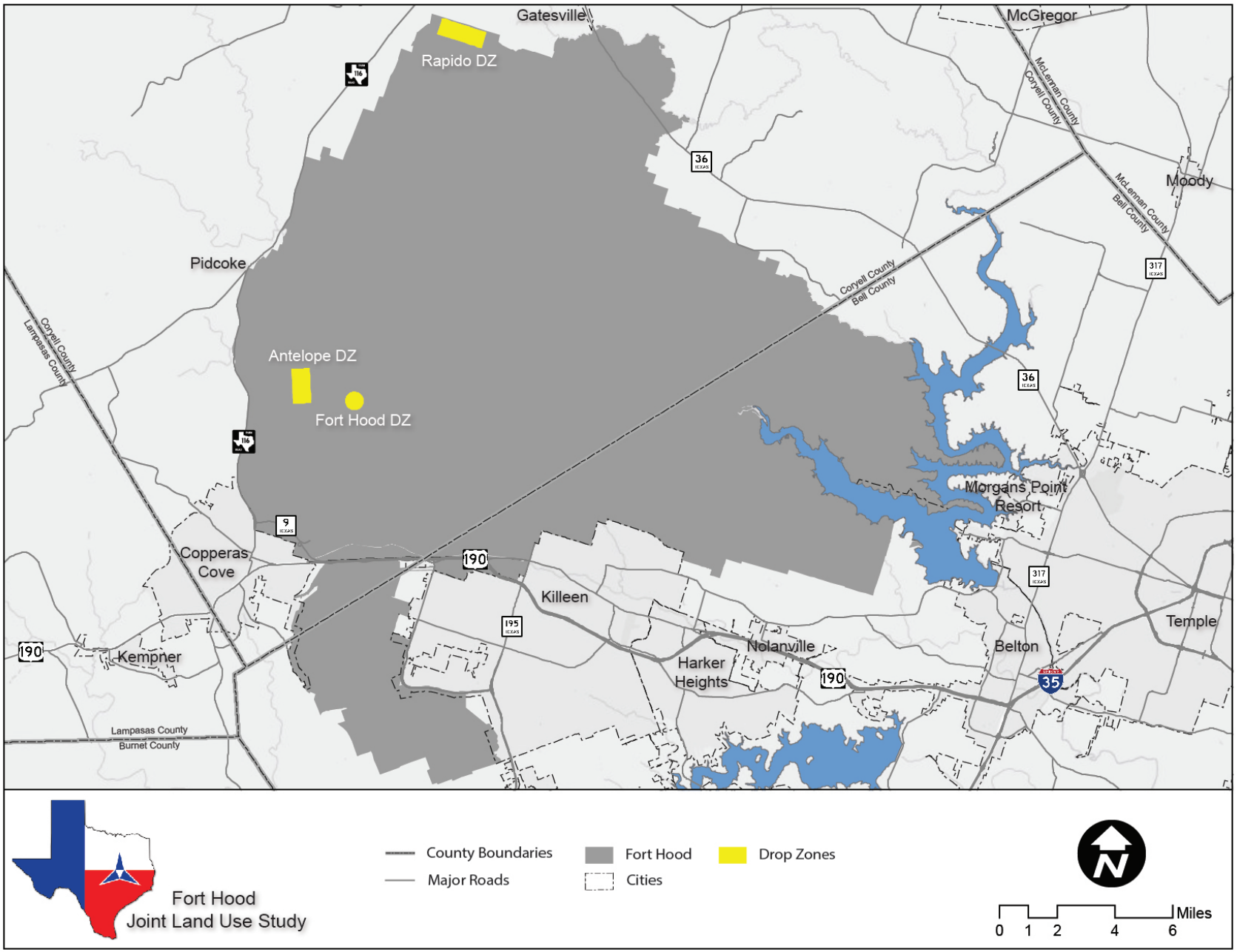


to navigate when taking off and landing at Robert Gray AAF due to the requirement that they stay above the installation and not overfly civilian development in the vicinity of the airfield. As the study progressed, it has been learned that greater use of UAS outside of Fort Hood's regulated airspaces was imminent, although with significant requirements for maintaining positive control over the aircraft.

AIRBORNE OPERATIONS

Fort Hood currently maintains three drop zones (DZ) on the installation. While there are limited airborne capable units on the installation, this is a necessary resource for maintaining their proficiency locally. The DZs also allow Fort Hood to host training for visiting airborne units. Map 3.15 on the facing page identifies the location of the three DZs on Fort Hood.

▼ MAP 3.15 DROP ZONES



LAND USE COMPATIBILITY ASSESSMENT

SECTION FOUR

LAND USE COMPATIBILITY ASSESSMENT

4.1 OVERVIEW

The assessment of the degree of compatibility between civilian land uses and military training operations is the core of the Joint Land Use Study. By analyzing the current state of compatibility, the installation and communities can better understand the degree of risk associated with both current and future encroachment of potentially incompatible civilian land uses into areas subject to military training impacts. By identifying the degree of risk, or encroachment concern, the communities partnering with Fort Hood on the study can make well informed decisions about the nature and extent of any mitigation measures that may be appropriate to employ to reduce encroachment risk from the incompatible development or use of land.

This section focuses on the measurable impacts that were observed by the study, identifying the extent of encroachment concern associated with each of the known military training impacts. The assessment also includes an assessment of two items of particular note that were discussed by the committees during the JLUS process. The first is associated with the initial deployment of the Terminal High Altitude Area Defense (THAAD) air defense missile system at Fort Hood. The second item is the potential for the construction of a new runway at KFHRA.

4.2 COMPATIBILITY FACTORS

The primary factors that this study examines are the measurable impacts associated with noise and safety hazards. The DoD and its subordinate agencies have each developed guidelines to help installations and communities assess the compatibility of their activities or development with military training impacts.

4.2.1 NOISE COMPATIBILITY

Land use compatibility with activities that generate high noise levels is generally measured along a continuum of intensity of the land use and noise, with inversely proportional impacts and susceptibility to high noise levels based on the intensity of the use. For instance, a single family home, among the lowest intensity "developed" land uses, is also one of the most susceptible to high noise levels when such development encroaches into areas subject to high noise levels. Conversely, a manufacturing use developed in a similar high noise area would likely be much more compatible given the greater intensity of the use.

In addition to land use, the density of development can also play a major role in maintaining noise compatibility. Permitting greater concentrations (such as smaller lots or multi-family developments) or residential dwellings to encroach into high noise areas exposes a larger population to the potential noise impact. In areas where it is feasible, restricting certain types of potentially incompatible and noise sensitive uses from encroaching into a high noise area can help to mitigate the exposure of the population to the noise impact.

While high noise levels can pose a safety issue with prolonged exposure to extreme noise, the most common issue with noise compatibility is the degree of annoyance experienced by people who reside, work or recreate in areas that encroach into areas subject to military training impacts. To aide in assessing the degree of potential concern from civilian land uses encroaching, the military has developed a standardized set of tools that make recommendations on the appropriate types of land use for certain noise environments and to assess the risk of complaints for certain types of noise that may be more sporadic or have a greater degree of perceptibly because of the frequency at which the sound waves travel.

For informational purposes, a table showing the relation of certain A-weighted decibel levels (used for aviation noise) to common noises and the effect that exposure to such noise levels has on humans is shown in Figure 4.1 below. These, along with a range of other factors have gone into the development

▼ FIGURE 4.1 COMPARABLE NOISE LEVELS

SOUND	dBA	EFFECT
Jet Engines (Near)	140	
Jet Takeoff (100-200 Fort)	130	Threshold of pain (125 dBA)
Thunderclap (Near)	120	Threshold of sensation (120 dBA)
Chain Saw	110	
Jet Fly-over (1000 Fort)	103	
Garbage Truck/Cement Mixer/ Farm Tractor	100	Regular exposure for 1 minute or more risks permanent hearing loss
Lawnmower, Food Blender	85-90	Level at which hearing loss begins (8 hour exposure)
TV	70-90	
Diesel Truck (40 Mph, 50 Fort)	84	
Garbage Disposal	80	Annoyance; constant exposure may cause hearing loss
Vacuum Cleaner, Hair Dryer	70	Intrusive, interference with conversation
Normal Conversation	50-65	Comfortable
Refrigerator	40	
Whisper	30	Very quiet
Rustling Leaves	20	Just audible
Normal Breathing	10	
	0	Threshold of normal hearing

of compatible use recommendations for high noise environments. A simple example of this type of compatibility guidance, derived from the original Federal Inter-agency Committee on Urban Noise, which has been widely used in land use compatibility planning for over 3 decades, is shown in Figure 4.2 above. This reinforces the inverse correlation between noise compatibility and general intensity of use, with intensity meaning both the intensity of the specific use and the potential for the use or development pattern to concentrate large numbers of people in a manner that encroaches into an area with high noise potential.

▼ FIGURE 4. 2 EXAMPLE LAND USE COMPATIBILITY GUIDELINES FOR A-WEIGHTED NOISE LEVELS

	NZ II		NZ III	
LAND USE	**65 TO 70 DB**	**70 TO 75 DB**	**75 TO 80 DB**	**80 TO 85 DB**
Households	Y	Y	N	N
Manufacturing	Y	Y	Y	Y
Retail – General	Y	Y	Y	N
Restaurants	Y	Y	Y	N
Personal Services	Y	Y	Y	N
Hospitals	Y	Y	N	N
Government	Y	Y	Y	N
Education	Y	Y	N	N
Public Assembly	Y	N	N	N
Parks	Y	Y	N	N
Agriculture	Y	Y	Y	Y

Source: FICUN 1980

▼ FIGURE 4.3 IMPULSIVE NOISE COMPLAINT RISK

PERCEPTIBILITY	DB PK15	RISK OF COMPLAINTS
May or may not be Audible	**<115**	**Low**
Noticeable, Distinct	**115 - 130**	**Moderate**
Very Loud, May Startle	**>130**	**High**

Impulsive noise, such as artillery fire and noise from demolition training, while loud, often is either sporadic in nature, or a singular event. As there is no long term exposure to the noise, the military developed guidance on the expected degree of complaint activity, expressed as the "risk of complaint" from households or businesses that encroach into areas subject to impulsive noise events. The degree of risk of complaint along with the peak noise level and estimated perceptibly are shown in Figure 4.3 below. While not expressed as such in the guidance, the degree of complaint risk for impulsive noise tends to track closely with the degree of compatibility for other high noise level measures.

4.2.2 COMPATIBILITY WITH AIRCRAFT ACCIDENT POTENTIAL

Like the noise compatibility guidelines, the various services promulgate recommendations for assessing compatible use in areas subject to increased levels of aircraft accident potential with the goal of helping communities understand how to reduce encroachment by incompatible civilian land uses into these areas. A generalized example of accident potential zone compatibility guidance is shown in Figure 4.4.

▼ FIGURE 4.4 LAND USE COMPATIBILITY GUIDELINES FOR AIRCRAFT ACCIDENT POTENTIAL ZONES

LAND USE	CLEAR ZONE	APZ I	APZ II
Single Family Unit	N	Y	Y
Multifamily Dwellings	N	N	N
Manufacturing	N	N	Y
Trans, Comm and Utilities	Y	Y	Y
General Retail	N	N	Y
Restaurants	N	N	Y
Personal Services	N	N	Y
Other Services	N	N	Y
Government Services	N	N	Y
Educational Services	N	N	N
Cultural Activities	N	N	N
Medical Services	N	N	N
Churches	N	N	N
Playgrounds	N	N	Y
Regional Parks	N	Y	Y
Assembly Areas	N	N	N
Other Outdoor Recreation	N	Y	Y
Agriculture	Y	Y	Y
Livestock Farming	N	Y	Y
Forestry Activities	N	Y	Y
Permanent Open Space	Y	Y	Y

Source: U.S. Air Force AICUZ Planning Guidance

Accident potential zones are generally divided into three categories with the Clear Zone being the most critical to protect. The Clear Zone is the area closest to the runway, and the location of the greatest risk for aircraft accidents. As such, land uses other than agriculture open space, and certain transportation or utility uses are typically prohibited when enforced through a local government zoning ordinance based on the military compatible use guidance. Encroachment by incompatible development into these areas is often seen as the greatest threat to military flight operations. Beyond the clear zone, Accident Potential Zone 1 (APZ I) has many of the same recommendations for compatible land uses as the Clear Zone, but begins to include some low intensity land uses, including single family dwellings, with conditions on development density. Accident Potential Zone 2 (APZ II) has the fewest number of recommended land use restrictions, but still encourages the prohibition of the encroachment of certain sensitive land uses into these areas and maintains recommendations for limiting residential density to limit the exposure of the population in case of an accident.

4.3 ENCROACHMENT AWARENESS

For the purposes of this Joint Land Use Study, the quantifiable off-post impacts that are associated with training at Fort Hood were merged into a single unit that is referred to as the "Encroachment Awareness Area." This is intended to serve the purpose of establishing the *current* area in which the partners in this study should maintain heightened vigilance with regard to potentially incompatible civilian land uses encroaching into critical areas that may experience the effects of military training, such as high noise levels. A map detailing the extent of the overall Encroachment Awareness Area is shown in Map 4.1 on the following page.

As noted above, the emphasis is on the current extent and type of training impacts that are present in the region. The area of specific concern is limited by the quantifiable / mappable extent of the impacts. Changes in mission posture, weapons systems, training tempo, deployed strength, alterations to ranges and a host of other factors can cause the areas where civilian encroachment poses a concern for training to expand, contract and shift around the installation, or even do all three simultaneously. The point being that unknown future changes may cause shifts in the areas of Encroachment Awareness, and so vigilance will be key to ensuring that changes are monitored and communicated to all of the partners in the region as the potential for encroachment concern shifts to different areas over time.

4.3.1 COMPATIBILITY IN ENCROACHMENT AWARENESS AREAS

The following is a summary of the findings of the assessment of the compatibility of land uses with the various military training impacts identified in the JLUS within the Encroachment Awareness areas.

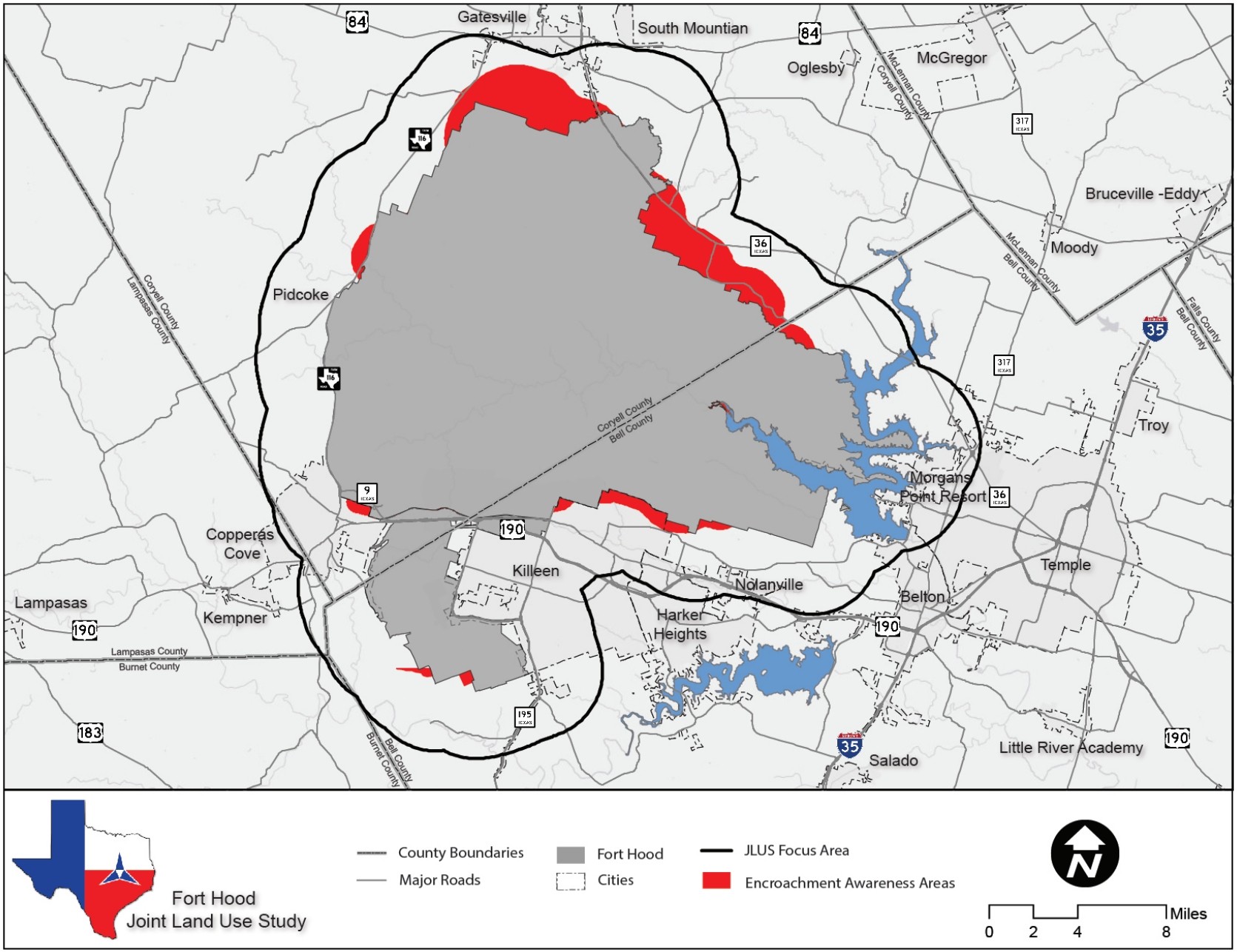
SMALL CALIBER WEAPONS NOISE

Of the approximately 300 acres of land within the 87-104 dB noise zone associated with fixed point firing ranges outside of the installation boundary, all is currently undeveloped, and thus, at the present time, poses a very low encroachment concern due to the compatibility of the land with the noise environment.

The variable nature of the small arms firing locations that occur at TA-40 and the Phantom Run range, make precise measurements of compatibility or encroachment concern somewhat imprecise. In this case, we observe the maximum extent of the potential for encroachment by incompatible development.

With regard to TA-40, the compatibility of the 32 acres of residential and commercial development in the 104+ dB noise contour carries a higher degree of encroachment concern, but this is tempered somewhat, again, due to the variability in the location of firing points in the training area, and the low likelihood of constant or repeated exposure on a regular basis at the maximum level. Instead, this demonstrates the degree to which encroachment by a potentially incompatible use has occurred.

▼ MAP 4.1 ENCROACHMENT AWARENESS AREAS



With regard to Phantom Run Range, nearly 160 acres of residentially developed land are present within the 104 dB PK15 noise contour associated with small arms fire at this variable point range. Like TA-40, the low likelihood of constant or repeated exposure of these high noise levels given the variability in small arms firing locations reduces the degree of encroachment concern, despite the theoretically low degree of compatibility.

LARGE CALIBER WEAPONS NOISE

The moderate complaint risk area (115-130 dB PK15 noise contour) associated with large caliber weapons fire contains over 17,000 acres of land, nearly 85% of which is undeveloped. There are over 1,500 acres of residentially used land, as well as over 200 acres of civic / institutional land use in these areas, which can be less than fully compatible with high noise levels.

Of the approximately 1,100 acres of land within the high complaint risk area (130+ dB PK15 noise contour). the overwhelming majority is undeveloped, however 23 acres are in residential use. This minor encroachment of residential uses in this area, while not necessarily compatible, does not presently pose a significant risk at the present time.

AIRCRAFT ACCIDENT POTENTIAL

There is a low degree of encroachment concern associated with the current accident potential zones at Robert Gray AAF and no concern with the APZs at Hood AAF, as they are confined within the installation boundary. At Robert Gray AAF, only 173 acres of APZ 2, the lowest risk of the APZs, falls outside of the installation boundary. Of this, nearly 99% is undeveloped, with only around 2 acres of residentially used land in the APZ. Based on the APZ recommendations and the size of the parcel that this particular dwelling sits on, there is little current encroachment concern with the APZ due to the compatibility of the land uses found within it.

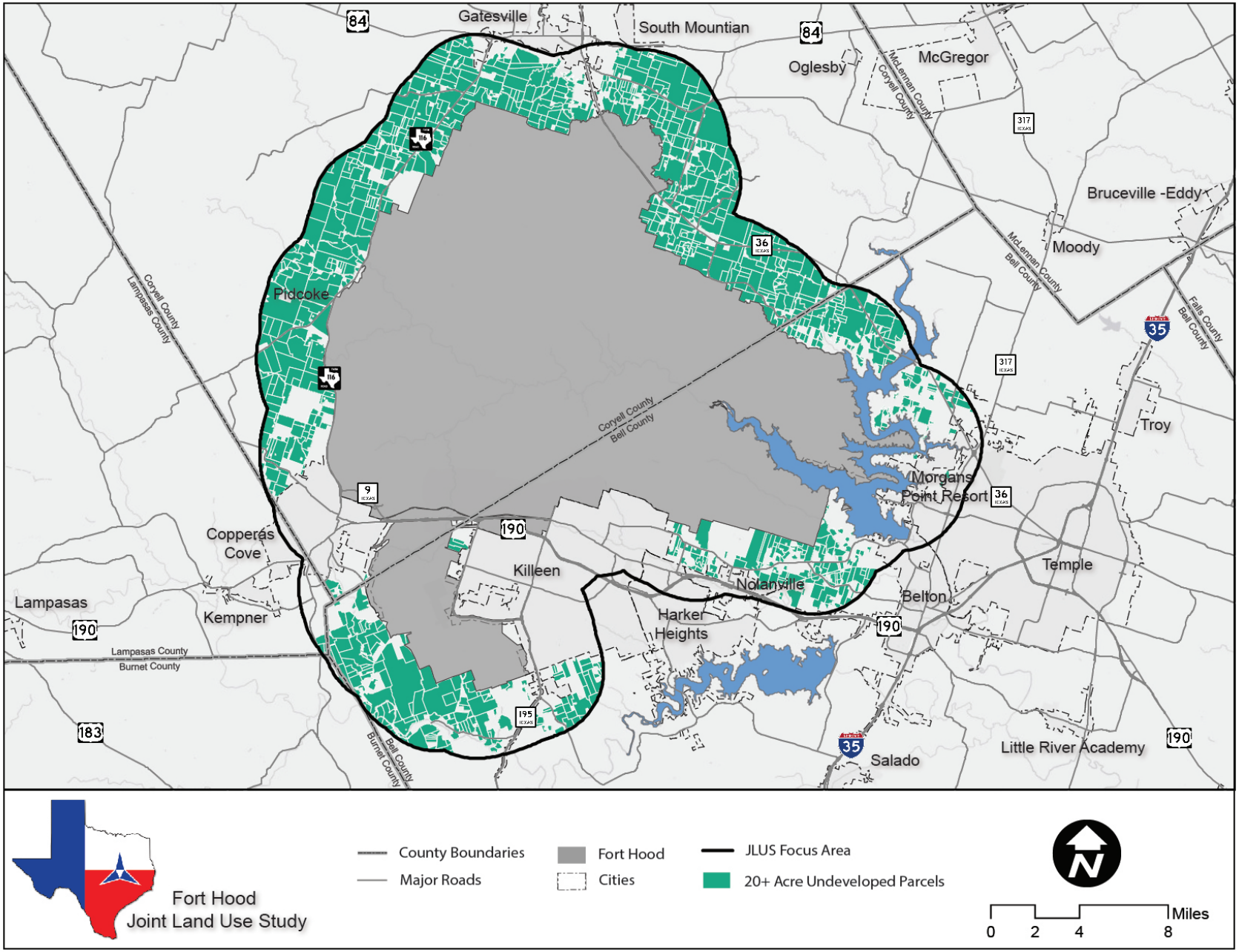
AIRCRAFT NOISE

The noise contours for aircraft operations at Robert Gray AAF are the only mapped aviation noise contours at the present time. Approximately 20 acres of the Noise Zone 2 area (65-75 dBA noise contour) fall outside of the installation boundary. All of this land is currently undeveloped, and due to the compatibility of the land in the area, there is a low encroachment concern at the present time.

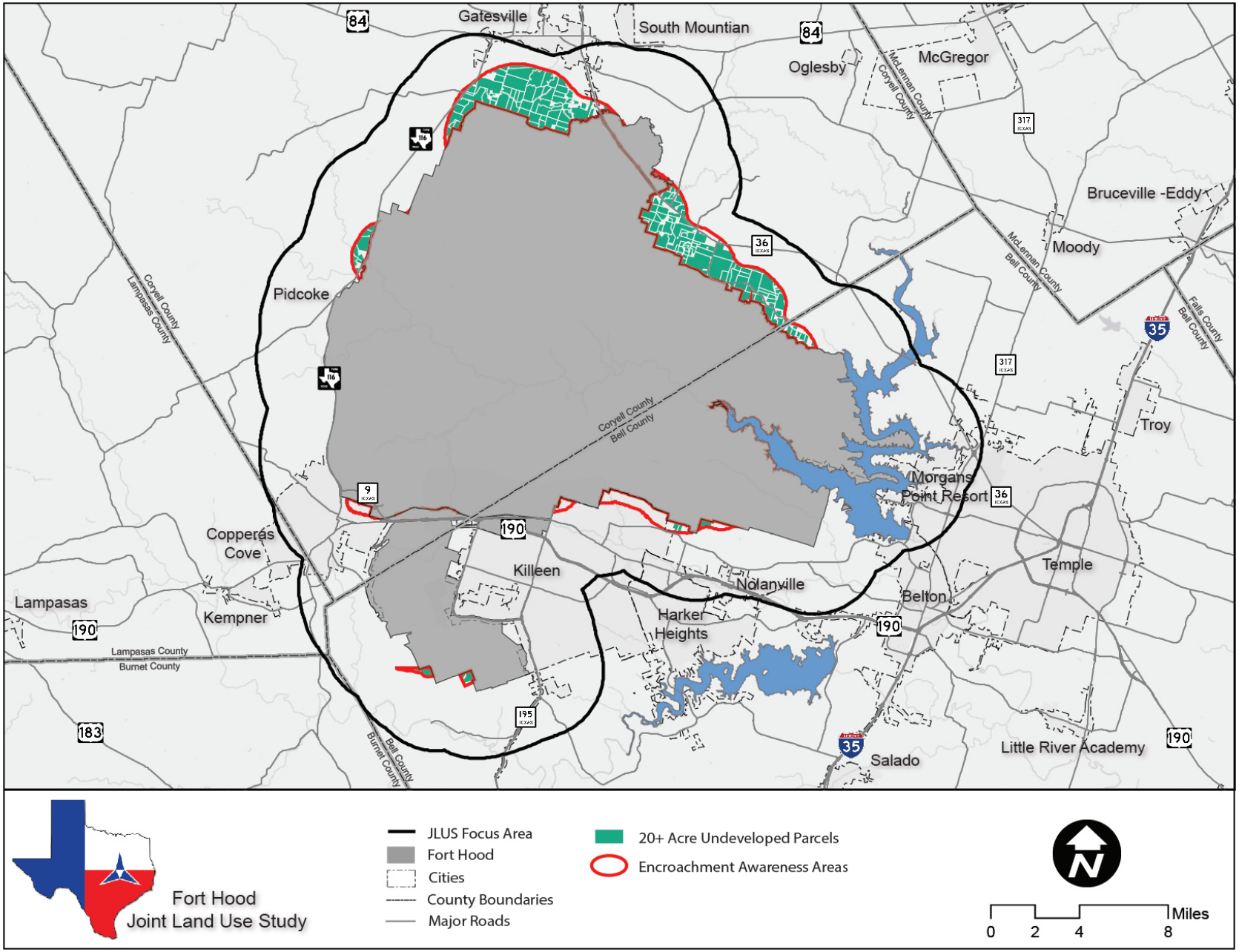
GROWTH POTENTIAL IN ENCROACHMENT AWARENESS AREAS

The maps shown in 4.2 and 4.3 are intended to convey the extent to which there are land resources available for development, much of it not subject to regulation, within the JLUS Focus Area, but also within Encroachment Awareness Areas. The green parcels on the maps represent parcels larger than 20 acres in size that are currently undeveloped. As Map 4.3 demonstrates, the amount of land within the areas of potential encroachment concern along Fort Hood's northern boundary. While not predictive of future growth or encroachment concern, the availability of such significant land resources increase the potential for encroachment.

▼ MAP 4.2 UNDEVELOPED PARCELS 20 ACRES AND GREATER



▼ MAP 4.3 ENCROACHMENT AWARENESS AREAS AND UNDEVELOPED PARCELS 20 ACRES AND GREATER



4.4 EMERGING COMPATIBLE USE ISSUES

The study also examines two emerging compatibility issues that are summarized in this section. The first of these, which receives a good deal of analysis, is spectrum encroachment in general and the pending deployment of THAAD batteries from the 69th ADA Brigade for training at Fort Hood once the necessary training facilities are constructed. The second matter is the potential for the construction of a second, 10,000 foot parallel runway at Robert Gray Army Airfield.

4.4.1 SPECTRUM COMPATIBILITY / THAAD

The 2015 Sustainable Ranges Report to Congress defines the encroachment factors and assessment criteria for the Army. The spectrum encroachment criteria are defined as "constraints placed on training due to unavailability of or interference with required electromagnetic spectrum."[1] The proposed Terminal High Altitude Area Defense (THAAD) radar training pads and their accompanying mission is the primary mission at Fort Hood that has the potential to experience and create spectrum-related encroachment issues. This white paper explores the potential spectrum-related impacts the proposed THAAD sites may have on the community, the potential impacts the community may have on the THAAD training mission, and potential recommendations to prevent spectrum encroachment issues.

The proposed construction of two THAAD radar training pads and their associated mission include the potential for spectrum encroachment challenges. Research and interviews with community and installation stakeholders indicate there are no current spectrum encroachment challenges impacting the Fort Hood mission or the surrounding community.[2] However, the Fort Hood has proposed the construction of two THAAD radar training pads in the northwestern portion of the post. The operations and training associated with the THAAD radar pads present potential spectrum challenges within the Fort Hood JLUS Study Area due to the THAAD's use of powerful radar signals.

The sections below provide relevant background information on THAAD development, potential community impacts, the current situation and a summary.

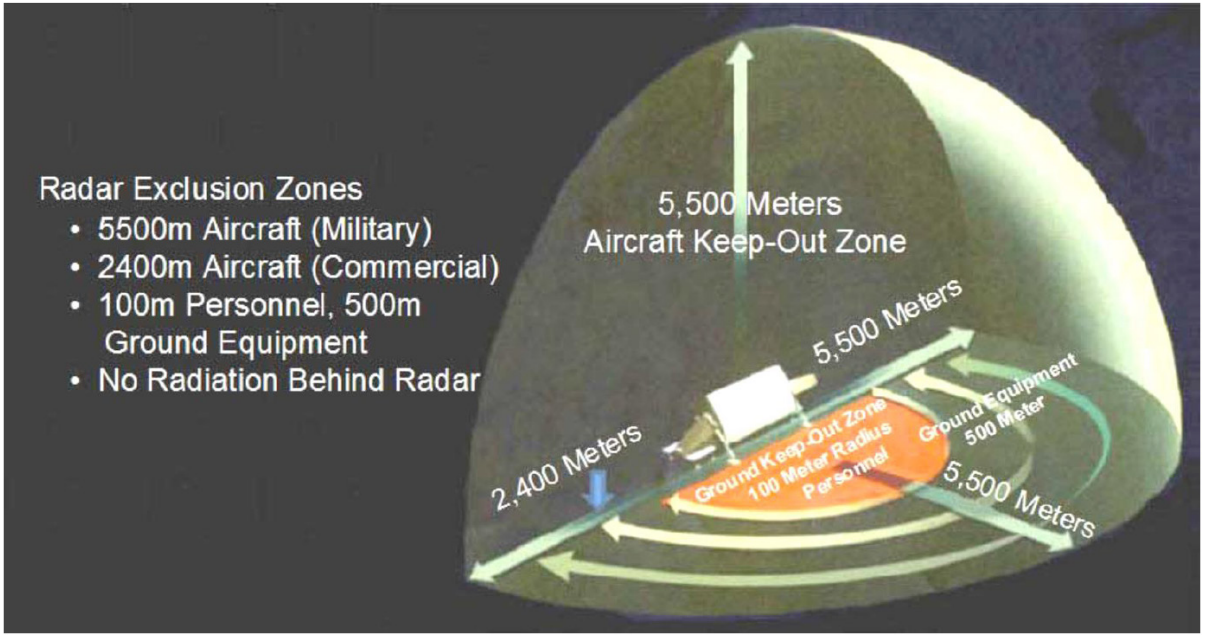
BACKGROUND - TERMINAL HIGH ALTITUDE AREA DEFENSE

The THAAD is a globally-transportable, rapidly-deployable system capable of intercepting and destroying ballistic missiles during their final phase of flight. The THAAD system is an element within the larger Ballistic Missile Defense System (BMDS). The THAAD battery consists of four main components: the launcher, interceptors (missiles), radar, and fire control and communications. The purpose of the THAAD is to intercept and destroy enemy-fired ballistic missiles on their final, or terminal, approach. Interceptor missiles are fired from the launcher and destroy incoming ballistic missiles at a high altitude to mitigate mass destruction. The radar component of the THAAD battery searches, tracks and discriminates objects, communicating that information to the interceptor missiles as they pursue and destroy their intended targets.[3]

According to Fort Hood personnel, the proposed THAAD training sites will not include the active launcher or interceptor missile pieces of the overall THAAD battery, but will include the radar only. The THAAD radar is the Army Navy/Transportable Radar Surveillance and Control Model-2 (AN/TPY-2) Terminal Mode (TM) system. The AN/TPY-2 (TM) consists of four units: the antenna equipment unit (AEU), the electronic equipment unit (EEU), the cooling equipment unit (CEU), and the prime power unit (PPU). The AEU transmits and receives radio frequencies to support search, track and communication with the interceptor missiles. The AEU performs the traditional radar functions of the AN/TPY-2 (TM) and is the component that would create or be affected by spectrum encroachment issues. The EEU houses signal and data operator equipment, the CEU houses equipment which cools the AEU and EEU, and the PPU powers the entire THAAD system.[4]

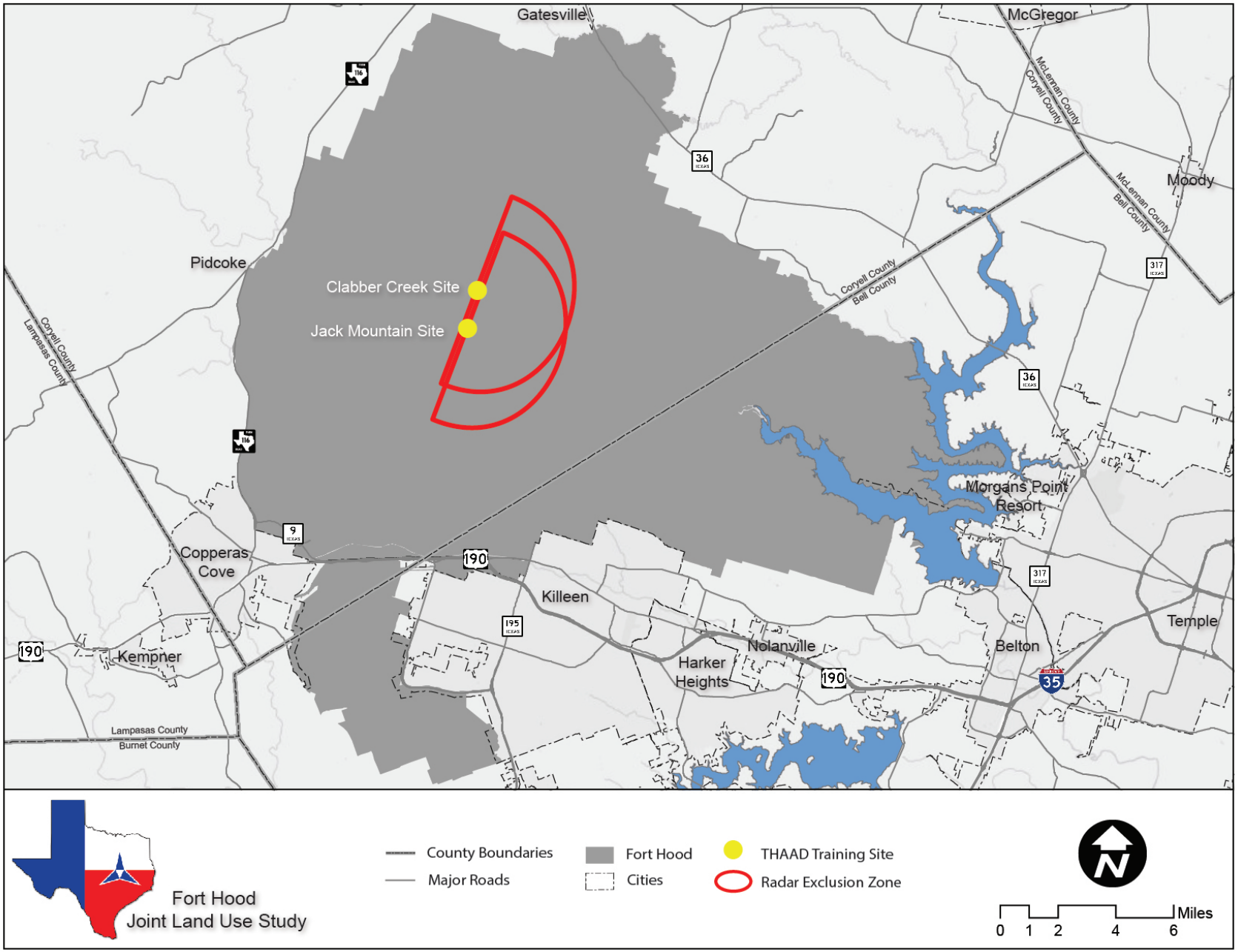
The frequency range of the AN/TPY-2 (TM) is between 8.55 and 10 gigahertz (GHz).[5] Other applications that utilize this spectrum range include wireless networking, satellite links, amateur radio, microwave links and satellite television. When working at full power the AN/TPY-2 (TM) has a range of 1,000 km, however the radar exclusion zones associated with the AEU are much smaller, as seen in Figure 4.5. The radar exclusion zones for THAAD extends to include all airspace within 5,500 meters in the direction the AEU is facing. Powerful radar energy present within the exclusion zones when the THAAD is active creates safety concerns, and objects within the AEU's line-of-sight can interfere with the THAAD's mission of searching, tracking, and discriminating ballistic missiles.

▼ FIGURE 4.5 TERMINAL HIGH ALTITUDE AREA DEFENSE RADAR EXCLUSION ZONES



Source: Department of Defense, Missile Defense Agency, Integrated Flight Tests at Wake Atoll Final Environmental Assessment, May 15, 2015.

▼ MAP 4.4 PROPOSED THAAD RADAR TRAINING SITES



CURRENT SITUATION

Fort Hood has proposed locations for two THAAD training sites approximately eight miles north of the main cantonment area along the western edge of the impact area near the center of the installation. The Clabber Creek Range and the Jack Mountain Range locations are shown in Map 4.4.

As mentioned in previous sections, the THAAD training sites at Fort Hood will not include the launcher or interceptor missile components of the complete THAAD system. Training will solely involve the use of the AN/TPY-2 (TM) radar system.

SUMMARY

Although the AN/TPY-2 (TM) is a powerful radar with a large radar exclusion zone, the THAAD radar pad sites are correctly sited and will not create any issues with spectrum encroachment. The 5,500-meter exclusion zones associated with each THAAD proposed site would be completely contained within the live-fire training area of Fort Hood. The proposed THAAD sites are also located on the western edge of the post and face inward, making it very unlikely that tall structures off the installation could impede the radars' lines of sight.

Any spectrum-related encroachment on the proposed THAAD sites would most likely come from within the fenceline. Aircraft and ground operations within the 5,500-meter radar exclusion zone may interrupt THAAD training due to safety concerns for personnel as well as radar line-of-sight impedance.

Due to the location of the proposed THAADs, it is also unlikely the community will experience spectrum encroachment from the radars. However, if the proposed locations change and the radar exclusion zones reach off post, the THAAD radar may interfere with spectrum-dependent devices such as wireless networks, satellite links, amateur radio, microwave links and satellite television.

SPECTRUM COMPATIBILITY FOOTNOTES

[1] Secretary of Defense, Under Secretary of Defense (Personnel and Readiness), 2015 Report to Congress on Sustainable Ranges, February 12, 2015.

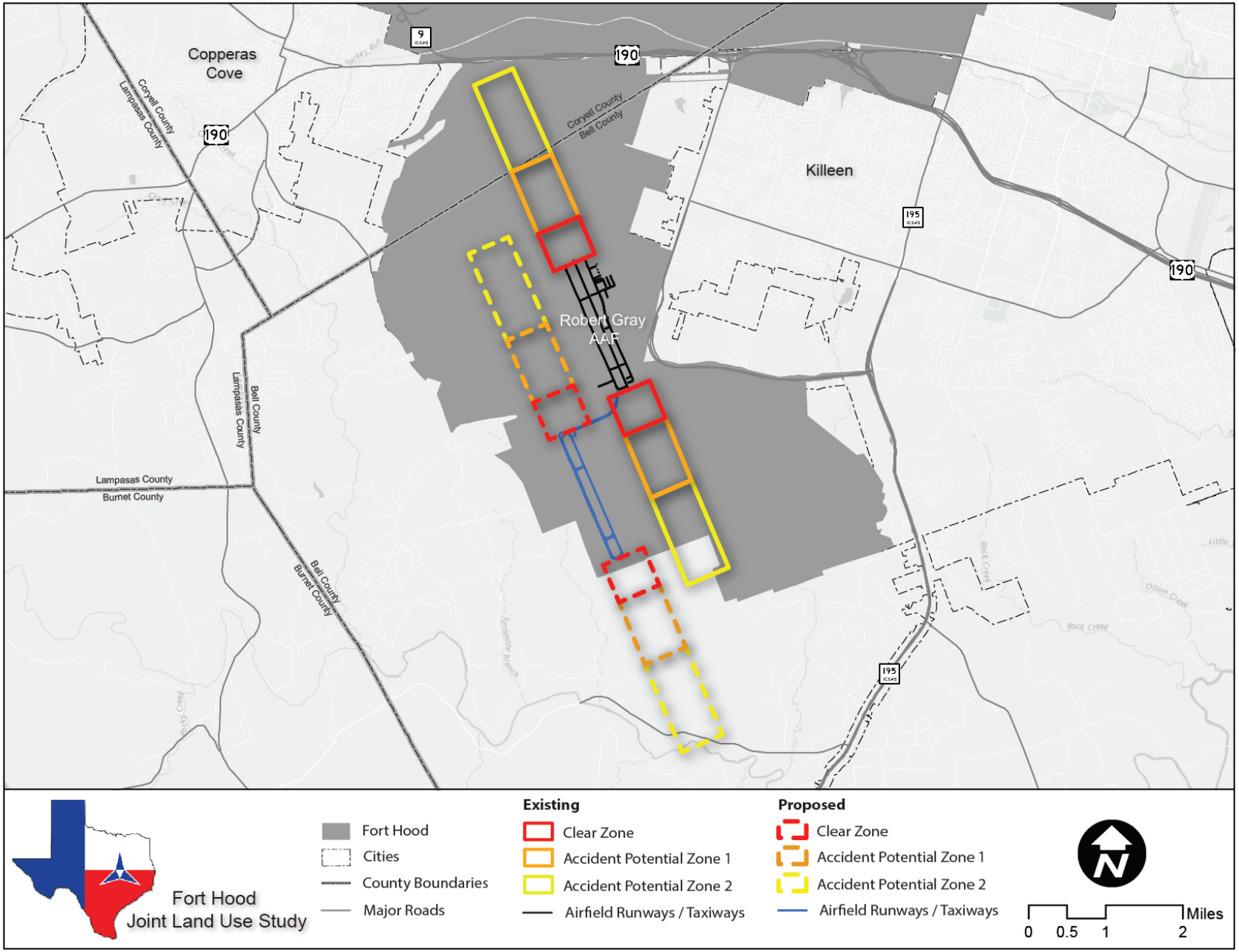
[2] Benchmark, CMR, Inc., "Fort Hood Joint Land Use Study: Project Update," (PowerPoint, January 13, 2016), http://forthood-jlus.org/images/presentations/FortHoodJLUS_CommitteePresentations_20160113_web.pdf.

[3] "Terminal High Altitude Area Defense (THAAD)," Missile Defense Agency, June 28, 2016, http://www.mda.mil/system/thaad.html.

[4] Department of Defense, Missile Defense Agency, Integrated Flight Tests at Wake Atoll Final Environmental Assessment, May 15, 2015.

[5] "AN/TPY-2," Radar Basics, accessed August 5, 2016, http://www.radartutorial.eu/19.kartei/karte119.en.html#this.

▼ MAP 4.5 POTENTIAL SECOND RUNWAY ACCIDENT POTENTIAL ZONES AT ROBERT GRAY ARMY AIRFIELD



4.4.2 ROBERT GRAY AAF SECOND RUNWAY

Map 4.5 on the facing page details the location and theoretical extent of the Accident Potential zones associated with the design length and location of a second parallel runway at Robert Gray AAF. The proposed runway has been designed at a length of 10,000 feet, however there is not yet a consensus about the necessary length. As currently conceptualized, a significant portion of the Clear Zone on the southern end of the runway would fall outside of the installation boundary, while all of the APZ 1 and APZ 2 area would fall outside of the boundary on the south end as well. The current use of the property in this area outside of the installation that would potentially be impacted by the APZ 1 and APZ 2 is the current location of Parrie Haynes Ranch, which hosts a variety of outdoor recreational activities and is mostly undeveloped. Until such time that a final design is determined for the runway, an accurate assessment of the compatibility of the new facility will be difficult to achieve.

COMPATIBILITY TOOLS
SECTION FIVE

COMPATIBILITY TOOLS

A number of tools are available to help establish a framework for compatible growth. Each community may consider a wide range of voluntary to regulatory approaches for implementation as they determine appropriate. This section of the report includes a review of the Federal, State and Local compatibility programs and tools that are applicable.

5.1 FEDERAL PROGRAMS

The following federal programs augment efforts to maintain land use compatibility around Fort Hood and other Army installations around the country. These programs are currently available to or already are being put into action by the Fort Hood community.

READINESS & ENVIRONMENTAL PROTECTION INTEGRATION (REPI) PROGRAM & ARMY COMPATIBLE USE BUFFER (ACUB) PROGRAM

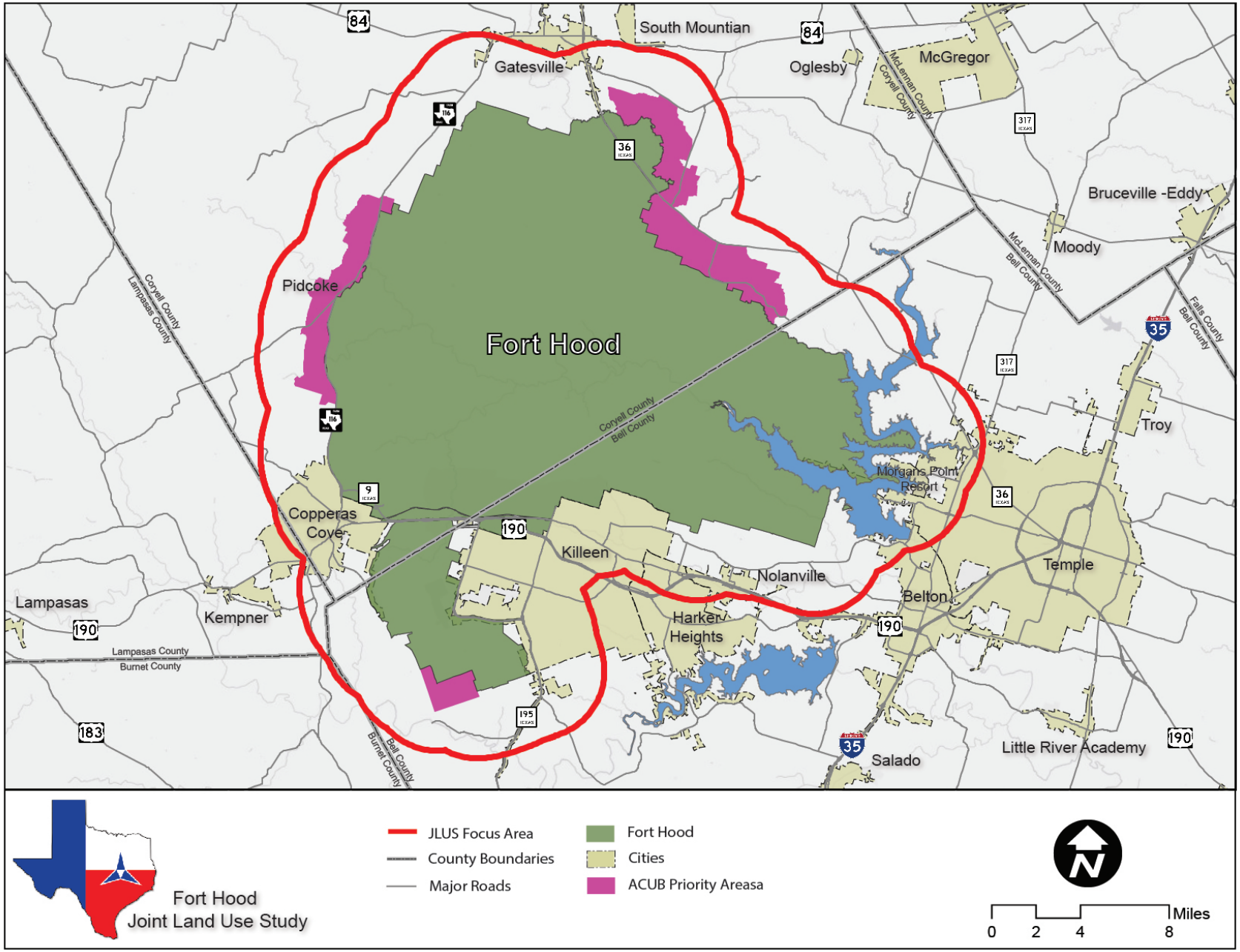
The Readiness and Environmental Protection Integration (REPI) program uses voluntary agreements between military service branches and states, local governments and non-federal conservation organizations to help protect military training areas from the encroachment of incompatible land uses. All REPI funds allocated with respect to Fort Hood are processed through the Army Compatible Use Buffer (ACUB) Program, which the Army implements under Title 10, Section 2684a of the U.S. Code. The Office of the Assistant Chief of Staff for Installation Management (OACSIM) manages ACUB at Army Headquarters. ACUB "cooperative agreements" encumber off-post lands without bringing them into ownership of the Army.

Fort Hood has participated in the REPI and ACUB programs in partnership with American Farmland Trust, Inc., the City of Copperas Cove, USDA, and the Compatible Lands Foundation. As of 2015, 1,140 acres along the boundaries of Fort Hood had been protected, with REPI funding through ACUB accounting for all of the 1,140 acres and $3.4 million in expenditures.

During the Joint Land Use Study, Fort Hood succeeded in the 2016 REPI Challenge to secure additional needed funding for the REPI/ACUB program at Fort Hood. Fort Hood joined NAS Patuxent and Fort Huachuca to leverage $5.2 million in REPI funds, plus over $20 million in partner funding to protect 7,929 acres at these three installations.

Fort Hood received $1.5 million of this funding, which will be leveraged with $2.2 million in local partner funding to protect an additional 1,015 acres adjacent to the post's western boundary.

▼ MAP 5.X FORT HOOD ACUB PRIORITY AREAS



Partners include:

1. The Compatible Lands Foundation
2. Department of Defense
3. Be Housing
4. Colorado River Land Trust
5. Farmer Veteran Coalition
6. Texas Center Point Veteran's Services
7. Texas Parks and Wildlife Department
8. US Department of Labor's Veterans Employment & Training Services
9. USDA's Natural Resource Conservation Service (NRCS)
10. Earth Day Texas, and other state and non-profit agencies.

INTEGRATED NATURAL RESOURCE MANAGEMENT PLANS

Department of Defense installations use Integrated Natural Resource Management Plans (INRMPs) to manage natural resources present on the installation, based on legal and stewardship requirements. Fort Hood's INRMP provides the mechanism for the post to both carry out its training mission and to implement ecosystem management principles to the maximum extent practical.

Importantly, the INRMP is Fort Hood's guidance for maintaining compliance with the Army's obligations under the Endangered Species Act (16 U.S.C. 1531), the Clean Water Act (33 U.S.C. 1344), and the protection of wetlands (Ex. Order 11990). Under the Endangered Species Act of 1973, specifically, the Army is required to assist in the recovery of all listed threatened and endangered species under an Army installation's authority.

Fort Hood's current INRMP was approved in 2014 and runs through 2018. The 2015 Biological Opinion for Fort Hood provides the requirements and guidance for endangered species at the post. At the time the JLUS was being performed, the INRMP was being updated to cover the years 2016-2020 and to include the 2015 Biological Opinion for Fort Hood.

It was noted too, during the JLUS, that the U.S. Fish and Wildlife Service (USFWS) would soon publish certain Endangered Species Act listing actions and make listing determinations and critical habitat designations, which could impact Fort Hood. Texas is located in service Region 2, along with Oklahoma, New Mexico, and Arizona.

INTEGRATED CULTURAL RESOURCE MANAGEMENT PLANS

Similarly, Integrated Cultural Resource Management Plans (ICRMP) provide a 5-year planning platform for military installations to integrate the preservation of cultural resources and the ongoing mission of the installation. In addition, ICRMPs will identify potential conflicts between the military mission and cultural resources and necessary compliance actions to ensure mission-essential properties remain ready for use. Fort Hood's Integrated Cultural Resource Management Plan was completed and accepted in June 2015 and covered through March 2020.

OPERATIONAL NOISE MANAGEMENT PLANS

The Operational Noise Program assists Army installations in matters related to noise stemming from Army and National Guard operations. Operational Noise Management Plans (ONMPs) test and describe Army training facility noise impacts and, since 1999, more than eighty (80) ONMPs have been developed for Army installations and National Guard training sites.

At the time of the JLUS, Fort Hood had in effect the U.S. Army Fort Hood Installation Operational Noise Management Plan, dated December 2012. It was expected to be undated in 2017.

ARMY-COMMUNITY PARTNERSHIP PROGRAM (ACPP)

The ACPP gives Army communities the opportunity to leverage local capabilities and resources to the mutual benefit of the local civilian community and its military neighbors. Four installations participated in the ACPP pilot program in 2015 and the ongoing intent of the program is to foster new partnerships at the local level that are tailored to the unique needs of the community and characteristics of the local military installation. Through the Office of the Assistant Chief of Staff for Installation Management (OACSIM), the ACPP can include the emerging tool of "Intergovernmental Support Agreements" (IGSAs), which rely on public-private partnerships to maintain mission readiness in a time of significant budget constraint.

In July 2016, the Army completed the "Community Partnership Blueprint: Summary and Strategy" for Fort Hood. This document lays out the partnership efforts that have been achieved already under the ACPP, those in progress, and those that have the potential to form in the future.

The EMS program related to joint monthly "giant voice" testing was begun in May of 2016 and puts into place monthly coordinated testing of the emergency notification system among Fort Hood EMS, the City of Killeen, and Bell County.

The ACPP Strategy identifies the following categories of partnership efforts currently in progress and details the status and next steps for each:

- Medical Services
- Human Resources
- Family, Morale, Welfare, and Recreation
- Emergency Management Services
- Public Works

Finally, the ACPP Strategy identifies nine (9) additional "potential partnerships" within the categories of Medical Services, Human Resources, Family, Morale, Welfare, and Recreation, and Emergency Management Services that may be pursued moving forward.

It is important to note as well, that Fort Hood cooperates and has maintained partnerships within this community for years.

Though they preceded passage of the 2013 National Defense Authorization Act's "installation support services" bill (see Public Law 112-239), formal partnerships with the JLUS jurisdictions already include agreements between Fort Hood related to the provision of public safety services with:

1. Bell County
2. Belton
3. Killeen
4. Copperas Cove
5. Coryell County
6. Gatesville
7. Harker Heights
8. Nolanville
9. Temple

GULF COAST STRATEGIC HIGHWAY COALITION

The Gulf Coast Strategic Highway System will connect Army installations in Texas and Louisiana to the strategic deployment seaports of Corpus Christi and the Port of Beaumont. Affected posts include Fort Hood, Fort Bliss and Fort Polk. On December 4, 2015, Congress officially designated the Central Texas Corridor generally as Highway 190 that will be Interstate 14 in the future.

5.2 STATE PROGRAMS

The State of Texas has been proactive in establishing statutory and programmatic support for the sustainability of its military installations. The statutes are described in detail in the previous section. The following section, on the other hand, describes the extent to which these state programs currently are in place in Fort Hood or which the JLUS Policy Committee determined would be appropriate for support of military functions locally in the future.

TEXAS MILITARY PREPAREDNESS COMMISSION (TMPC)

Chapter 436 of the Texas Government Code describes the authorities and activities of the Texas Military Preparedness Commission (TMPC) and the Texas Military Value Revolving Loan Fund.

In 2013, the Texas Legislature instituted the Texas Military Value Task Force (SB 1200, 83rd Texas Legislature), which was charged to (a) confer with defense communities and installations to identify strategies to improve base realignment scores; and (b) make recommendations to the TMPC and legislature for strengthening defense communities and installations and prevent closure or significant reductions.

In 2014, after holding three hearings around the state, the Task Force submitted its report, entitled "Texas Military Value Task Force: Preparing for the Future," to the TMPC. The purpose of the report was to increase the "military value" of Department of Defense installations in Texas and to make Texas the #1 "military friendly" state. The report contained nine categories of recommendations, as follows:

1. Public-Public, Public-Private (P4) Partnerships
2. Encroachment
3. Partnering
4. Opportunities for Mission Growth
5. Infrastructure
6. Utilities
7. Environment
8. Supporting Military and their Families
9. Funding

The 2016 Joint Land Use Study process itself is supportive of several of these recommendations. In fact, the second of the nine, "Encroachment," included the following:

Finding: Encroachment is an insidious issue that can have large impacts on installation mission growth or survival. Many encroachment standards are based on safety and therefore benefit all. DoD sets the standards, but each community and installation has its own implementation challenges and solution tools. Better to know the issues and mitigate solutions than let encroachment take away options for future growth.

Action and Desired Outcome: Communities encourage installations to conduct formal studies to establish baselines. Communities engage with installation leadership to mitigate solutions. Texas legislature enact laws to discourage or eliminate encroachment at military installations. US Congress pass legislation to remove tax incentives for businesses that encroach on military installations.

End State: Encroachment is not an issue for present or future missions.

See "Texas Military Value Task Force: Preparing for the Future," p. 13 (2014).

In addition, as is noted in the previous section, during the preparation of the JLUS, Texas legislative representatives were discussing eliminating certain tax abatements that would encourage encroachment on military installations in Texas.

Other important TMPC publications include its biennial reports (2015-16 is the most recent) and its Defense Master Plan Report (2011-12 is the most recent), which are available on the TMPC website.

Military communities should remain in regular contact with

the TMPC and maintain awareness of its statewide activities and publications that address military value. In addition, JLUS implementation tasks should be coordinated with the TMPC so local efforts take advantage of state level resources and reflect state level goals.

TMPC FUNDING AVAILABILITY TO DEFENSE COMMUNITIES

The TMPC offers several grants and loan opportunities to qualified defense communities, including "Defense Economic Adjustment Assistance Grants" (DEAAG) and the Texas Military Value Revolving Loan Fund (TMVRLF).

The DEAAG is an infrastructure grant program that assists defense communities affected positively or negatively by changes in defense contracts or announced changes to such contracts. Generally, there are two categories of eligibility:

1. local government defense communities requiring assistance due to significant loss of defense worker jobs; and
2. local government defense communities gaining new or expanded military missions and defense workers as a result of the Base Realignment and Closure process.

Tex. Admin. Code Rule § 4.32 (a) and (b).

DEAAG funds can be used for the purchase of DoD property, new construction or rehabilitation of facilities in support of job creating projects and opportunities. Grant awards range between $50,000 and $5 million. See Tex. Gov. Code Chapter 436, Subchapter E. Cities and counties are among those eligible for DEAAG grants (see Tex. Gov. Code 436.201). Recently, on March 31, 2016, the City of Killeen received $5.5 million DEAGG to repair and rehabilitate the Army Radar Approach Control facility at Robert Gray Army Airfield..

In addition, the Texas Military Value Revolving Loan Fund provides opportunities to defense communities to:

1. enhance the military value of its bases and facilities;
2. lessen the negative impacts of the BRAC processes in 2005 or later;
3. assist communities positively impacted by BRAC processes in 2005 or later;
4. supplement community economic redevelopment value of a closed base or facility; and
5. to prepare a community strategic impact plan (see Tex. Local Gov't Code §§ 397.003 and .004).

Tex. Gov. Code Chapter 436, Subchapter D.

If the TMPC approves an application submitted by a defense community, it will then partner with the Texas Economic Development Bank and other state agencies to facilitate the loan. Minimum loan amounts are $1 million for this program.

ELECTRIC RELIABILITY COUNCIL OF TEXAS (ERCOT)

As is detailed in Section 2, renewable energy is developing

rapidly in Texas and carries with it the potential to create serious conflicts with military facilities and operations. Both wind turbines and solar installations can impair military training and aviation maneuvers, in particular.

Proposed wind farms are subject to approval by the Federal Aviation Administration (FAA) and do not require direct approval by the Army or the Department of Defense (although DoD's input is considered). For this reason, military installations have sought processes that bring to their attention wind farms being proposed within military training areas early in the process. The intention for doing so is to allow coordination with land owners and regulatory agencies that could result in mitigation measures or other steps to prevent impediments to training that can result from these renewable energy projects.

During the development of the JLUS, therefore, the Policy Committee evaluated options that would allow Fort Hood flight operators to learn early on when a proposed wind farm is being considered near Fort Hood or within any of its more distant training areas. The Electric Reliability Council of Texas (ERCOT) was identified as the best source of this information.

ERCOT manages the transmission of 90% of the state's electric power and is responsible for scheduling power on the grid. ERCOT is a non-profit agency overseen by the Texas Public Utility Commission and the state Legislature.

Important for JLUS purposes, ERCOT is one of the first public agencies to engage with renewable energy providers when new renewable energy developments are being proposed. The agency maintains a database called the Generation Interconnection Study, which includes all projects under review. The Generation Interconnection Study is available to the public on the ERCOT website and, with regular reviews by Fort Hood, would be a source of information regarding new renewable energy projects that have not yet begun development. This would give Fort Hood and Army officials the opportunity to coordinate with local governments, state agencies, and private developers directly involved in the approval process for these projects and, perhaps, to engage in discussions to mitigate negative impacts on mission capability and installation sustainability.

5.3 REGIONAL PROGRAMS

The Fort Hood community already includes a number of long-established regional agencies – public and non-profit – that operate, at least in part, to support and sustain Fort Hood.

HEART OF TEXAS DEFENSE ALLIANCE

The Heart of Texas Defense Alliance (HOTDA) was formed as a non-profit in 2003 for the purpose

of promoting "the importance and sustainability of Ft. Hood and all defense related industries, organizations, and institutions in the Central Texas area of Bell County, Coryell County, and Lampasas County." (HOTDA website - www.hotda.org, as of August 2016)

HOTDA has played an important role during the development of the JLUS and the Force Reduction Assessment. During the JLUS process, the HOTDA Board of Directors approved the following six "Strategic Goals:"

1. Analyze local, state, and national information regarding future plans that potentially impact Fort Hood's force structure, functions, missions, and capabilities; assess and address regional weaknesses and threats; seek opportunities that sustain Fort Hood's authorized strength;
2. Maintain effective linkages with key Fort Hood, DoD, and Legislative decision makers;
3. Strengthen the "One Voice" approach to articulate the requirements of Fort Hood to the Central Texas defense community, adjacent regional communities and external audiences;
4. Facilitate municipal entity coordination with defense industries;
5. Advocate for military spouse, veteran and DoD/DA Civilian employment opportunities; and
6. Support initiatives to grow enrollments and facilitate efforts that encourage, create, and fund defense-related research opportunities at regional higher education institutions.

CENTRAL TEXAS SUSTAINABLE COMMUNITIES PARTNERSHIP

The Central Texas Sustainable Communities Partnership (known locally as "Cen-Tex") was formed for the specific purpose of combing regional sustainability efforts to improve overall quality of life and economic vitality of the region and its citizens. The Partnership includes Fort Hood as a member, as well as Copperas Cove, Gatesville, Harker Heights, Killeen, Belton, Nolanville, and Lampasas.

Cen-Tex signed a Memorandum of Understanding in 2009 to pursue sustainability in central Texas through voluntary programs. Members of the commission include the Fort Hood Garrison Commander, Fort Hood civilian staff, and volunteers from Fort Hood, as well as their counterparts in the municipalities. The objective of the MOU is to pursue common environmental goals and partnerships that contribute to the central Texas economy and quality of life. The MOU articulates five specific goals, including the following related to Fort Hood:

Sustainable Design: Cen-Tex will maintain the ability of Fort Hood to train, deploy and sustain its mission by promoting sustainable development of the Fort Hood region through mixed-use development, intermodal transportation networks, open space, and economic development.

See Cen-Tex Sustainable Communities Partnership website (www.centexsustains.org), visited August 2016.

Finally, the Cen-Tex Strategic Plan includes six (6) objectives, including:

1. Promote sustainable curricula in primary and/or secondary schools;
2. Present three Road Shows in 2013, with at least one being recorded for use on the web site/web media pages;
3. Hold three workshops covering various sustainability topics;
4. Promote Green Business Initiative;
5. Populate the Citizens Committee; having at least one member from each partner;
6. Apply for at least one grant to help achieve an objective from the Strategic Plan.

CENTRAL TEXAS COUNCIL OF GOVERNMENTS

The Central Texas Council of Governments (CTCOG) facilitates transportation and regional planning, environmental programs, economic development, and community technical support within the Central Texas region. See Central Texas Council of Governments website (www.ctcog.org), visited August 2016. Many CTCOG partners and executive members include representatives from the following participants in the Fort Hood JLUS:

1. Coryell County
2. Belton
3. Bell County
4. Fort Hood
5. Copperas Cove
6. Harker Heights
7. Killeen
8. Gatesville
9. Temple

In addition, the CTCOG facilitates a monthly planner's roundtable that brings together the region's planners and Fort Hood to discuss and coordinate regional transportation and planning matters on a regular basis.

5.4 TEXAS LAND USE STATUTES

This section identifies the general statutory authorities available to the study jurisdictions under the Texas statutes. The purpose of including this overview of city and county powers is to inform implementation strategies. Note, however, that implementation of these available tools should be conducted in light of applicable constitutional and case law limitations, including those relating to authority, takings, equal protection, due process and other state law principles.

OVERVIEW OF MUNICIPAL LAND USE AUTHORITIES

MUNICIPAL ZONING

IN GENERAL

Cities in Texas are authorized by Chapter 211 of the Texas Local Government Code to adopt zoning for the purpose of

"promoting the public health, safety, morals, or general welfare and protecting and preserving places and areas of historical, cultural, or architectural importance and significance." Tex. Local Gov't Code § 211.001. Chapter 211 of the Code is based generally on the original model Standard Zoning Enabling Act of 1926.

Areas of zoning powers include:

1. height, number of stories, and size of buildings and other structures;
2. the percentage of a lot that may be occupied;
3. the size of yards, courts, and other open spaces;
4. population density;
5. the location and use of buildings, other structures, and land for business, industrial, residential, or other purposes; and
6. the pumping, extraction, and use of groundwater by persons other than retail public utilities, as defined by Section 13.002, Water Code, for the purpose of preventing the use or contact with groundwater that presents an actual or potential threat to human health.

In addition, "[i]n the case of designated places and areas of historical, cultural, or architectural importance and significance, the governing body of a municipality may regulate the construction, reconstruction, alteration, or razing of buildings and other structures." Home-rule municipalities (which each of the JLUS municipalities are) may also regulate the bulk of buildings. Tex. Local Gov't Code § 211.003.

As discussed below, Chapter 213 of the Local Government Code authorizes cities to adopt a comprehensive plan, and Chapter 211 requires that any zoning be "in accordance with" a comprehensive plan. Tex. Local Gov't Code § 211.004. Municipalities without comprehensive plans may still adopt zoning, in which case, the zoning code is considered the comprehensive plan. See Mayhew v. Sunnyvale, 774 S.W. 2d 284 (1989). Other than Gatesville, each city that participated in the Joint Land Use Study had separate adopted comprehensive plans.

LIMITATION ON ZONING JURISDICTION

It is important to note that Texas municipalities are not authorized to exercise zoning powers beyond their corporate boundaries, except to the extent they implement airport zoning regulations as provided by Tex. Local Gov't Code Chapter 241, which is discussed below. This prohibition includes municipal extraterritorial jurisdictions (ETJs). In this case, this limitation is important because the JLUS Study Area includes large extents of land that are not within the boundaries of a municipality, but which could experience military training impacts and which could impact military training if they were to convert to incompatible land uses.

OVERLAY ZONING

In addition to air operation impacts at Fort Hood, there are

impacts associated with the post's maneuver and training areas, weapons and artillery ranges, and drop zones that could be negatively impacted by incompatible development and encroachment outside of the fence line. In order to address, prohibit or mitigate such impacts, the Texas statutes provide sufficient authority to the cities participating in the JLUS to adopt overlay zones to mitigate these impacts.

"Military overlay zoning" could be applied in cities within identified impact areas where the potential for significant threats to the sustainability of Fort Hood operations exist. Where appropriate, overlay zoning might limit densities, land uses and development patterns that would encourage concentrations of population in these impact areas.

The cities are authorized, under existing Texas statutes, to adopt zoning overlays within their corporate boundaries. See Tex. Local Gov't Code Chapter 211. However, municipal authority to zone does not extend into the cities' extraterritorial jurisdictions (ETJs) (except for the limited "airport zoning regulations" discussed below) and the counties, of course, are not authorized to implement zoning for military purposes at this time, although this authority has been given to some military communities in the state. See Texas Local Gov't Code Chapter 232, Subchapter D (authorizing limited one-mile "military zones" in counties with Navy or Coast Guard installations).

Therefore, should a city wish to implement a military zoning overlay to protect Fort Hood within their corporate boundaries, it may do so under current authorities pursuant to the procedures described in Texas Local Gov't Code Chapter 211, in accordance with existing and/or amended comprehensive plans. However, the current statutory authority to regulate within the ETJs (for impacts other than those associated with aircraft operations) is less expansive; therefore, additional statutory authorities would be required to mitigate or prohibit incompatible development within the cities' ETJs or the unincorporated areas of the counties in the JLUS study area.

MUNICIPAL BUILDING CODES

Chapter 214 of the Local Government Code authorizes or requires municipal regulation of certain housing standards. Subchapter G, "Building and Rehabilitation Codes," applies the International Residential Code to "… all construction, alternation, remodeling, enlargement, and repair of residential structures in a municipality." Tex. Local Gov't Code § 214.212(b). Furthermore, a municipality may establish procedures to adopt local amendments to the International Residential Code. The most likely building code amendments that would be recommended in this context are noise attenuation standards that would mitigate military training noise associated with air operations or artillery training. The Airport Compatibility Guidelines, issued by the Texas Department of Transportation in 2003, indicate that local government building codes may be amended to

require noise attenuation. See Airport Compatibility Guidelines: Compatibility Planning, Compatible Land Use Zoning for Airports in Texas, Texas Department of Transportation, Aviation Division, January 2003. In fact, as is discussed in Chapter X, the City of Killeen has adopted noise attenuation standards for lands in the vicinity of Skylark Field (formerly the Killeen Municipal Airport) and the Killeen Fort Hood Regional Airport area.

Unlike city zoning powers, it is generally accepted that home rule cities in Texas may enforce their building codes within the municipality's ETJ through their statutory subdivision authorities. Although the courts have not taken up the issue directly, during the JLUS, the Texas Supreme Court's decision in Town of Lakewood Village v. *Bizios* appeared to confirm this understanding of the law in Texas. The Bizios case specifically found that general-law cities are not authorized to enforce building codes within their ETJs.

MUNICIPAL REGULATION OF SUBDIVISIONS

Chapter 212 of the Local Government Code provides that "[after a public hearing on the matter, the governing body of a municipality may adopt rules governing plats and subdivisions of land within the municipality's jurisdiction to promote the health, safety, morals, or general welfare of the municipality and the safe, orderly, and healthful development of the municipality." Tex. Local Gov't Code § 212.002.

These powers extend into the extraterritorial jurisdictions (ETJ) of the cities, as do other municipal ordinances "related to access to public roads" and groundwater management. Tex. Local Gov't Code § 212.003. This authority, however, is subject to applicable limitations prescribed by agreement under Tex. Local Gov't Code § 242.001.

Section 212.004 provides that "[a] division of land under this subsection does not include a division of land into parts greater than five acres, where each part has access and no public improvement is being dedicated." This exclusion is different for counties (discussed below), under Chapter 232, which includes an exemption for lands greater than ten acres. Many cities elect to apply the 10-acre exemption within their ETJs, as well.

Although home rule cities appear to be authorized to enforce construction-related subdivision regulations, including building permit requirements, within their ETJs, the statutes prohibit the following types of regulation within an ETJ:

1. the use of any building or property for business, industrial, residential, or other purposes;
2. the bulk, height, or number of buildings constructed on a particular tract of land;
3. the size of a building that can be constructed on a particular tract of land, including, without limitation, any restriction on the ratio of building floor space to the land square footage;

4. the number of residential units that can be built per acre of land; or
5. the size, type, or method of construction of a water or wastewater facility that can be constructed to serve a developed tract of land if [certain conditions are met].

Tex. Local Gov't Code § 212.003.

The concern the legislature likely had was that municipal application of subdivision regulations within the ETJ not amount to zoning or land use regulation. See Town of *Annetta* S. v. Seadrift Dev., LP, 446 S.W. 3d, 823, 825 (Tex. App. Fort Worth 2014), reh'g overruled (Oct. 30, 2014) (invalidating lot restrictions in ETJ). Nonetheless, it was noted during the JLUS that the TxDOT's Airport Compatibility Guidelines assert that the municipalities have the authority through their subdivision powers to:

1. Require dedication of avigation easements or land
2. Restrict residential housing
3. Require noise attenuation

In addition, Texas Local Gov't Code § 212.171, et seq., provides that municipalities with a population of less than 1.9 million, may enter into development agreements with property owners in their ETJ in order to:

1. guarantee the continuation of the extraterritorial status of the land and its immunity from annexation by the municipality;
2. extend the municipality's planning authority over the land by providing for a development plan to be prepared by the landowner and approved by the municipality under which certain general uses and development of the land are authorized;
3. authorize enforcement by the municipality of certain municipal land use and development regulations in the same manner the regulations are enforced within the municipality's boundaries;
4. authorize enforcement by the municipality of land use and development regulations other than those that apply within the municipality's boundaries, as may be agreed to by the landowner and the municipality;
5. provide for infrastructure for the land, including:
    - streets and roads;
    - street and road drainage;
    - land drainage; and
    - water, wastewater, and other utility systems;
6. authorize enforcement of environmental regulations;
7. provide for the annexation of the land as a whole or in parts and to provide for the terms of annexation, if annexation is agreed to by the parties;
8. specify the uses and development of the land before and after annexation, if annexation is agreed to by the parties; or
9. include other lawful terms and considerations the parties consider appropriate.

Notably, a municipality cannot require a development agreement of this sort as a condition of providing water, sewer, electricity, gas, or utility service from a municipally-owned or -operated utility providing these services. Texas Local Gov't Code § 212.174.

Note that Chapter 242 describes shared city-county jurisdiction related to subdivision control in an ETJ. Finally, Tex. Local Gov't Code §§ 212.004, .0045, and .0046 limit cities' authority to regulate certain subdivisions of land.

MUNICIPAL COMPREHENSIVE PLANNING

Since 1997, cities in Texas have been authorized by Chapter 213 of the Local Government Code, at their option, to adopt a comprehensive plan "for the long-range development of the municipality." Tex. Local Gov't Code § 213.002. While the legislature has deferred to cities to define the content of their plans, the statute provides that the plan may:

1. include, but is not limited to, provisions on land use, transportation, and public facilities;
2. consist of a single plan or a coordinated set of plans organized by subject and geographic area; and
3. be used to coordinate and guide the establishment of development regulations.

Notably, cities may also, by ordinance or charter, define the relationship between their plan and their development regulations, including standards for determining consistency between the two.

MUNICIPAL UTILITY DISTRICTS (MUDS)

Title 4 of the Texas Water Code sets forth the statutes concerning general law districts established under sections 52(b)(1) and (2), Article III, or Section 59, Article XVI of the Texas Constitution. See Texas Water Code §49.001. Chapter 54 of Title 4 specifically describes "municipal utility districts" and the provisions related to their creation, operation, and status with respect to city and county rules and regulations.

Under Texas law, "municipal utility districts," or "MUDs," are created at the behest of impacted landowners and are formed in order to provide certain services historically provided by the public sector, including those related to stormwater; irrigation; reclamation; drainage; conservation of forests, water, and hydroelectric power; navigation of certain waters; water control and abatement; sanitation; and natural resources. See Tex. Water Code § 54.012.

MUDs can be created by landowner request to the Texas Legislature or to the Texas Commission on Environmental Quality. In either case, the Water Code weighs in favor of the creation of the MUD, potentially, but not necessarily contingent on the City's consent.

OVERVIEW OF COUNTY LAND USE AUTHORITIES

COUNTY ZONING

There is very limited authority for counties in Texas to implement zoning. Chapter 231 of the Local Government Code, however, describes those instances in which the legislature has granted some counties this authority. Though none apply to Bell or Coryell Counties, we have included an overview here for the sake of completeness and information for the JLUS and JLUS Implementation Committee.

1. Subchapter B authorizes zoning for Cameron and Willacy counties on Padre Island;
2. Subchapter C authorizes zoning powers for Val Verde County, near Amistad Recreational Area;
3. Subchapter D authorizes one-mile "military zones" in counties with U.S. Navy or U.S. Coast Guard installations present. These zones are limited to the regulation of speed, parking, and photography within the military zone;
4. Subchapters E through L authorize some zoning around certain lakes and defined lake, recreational, watershed, and historical areas, frequently only with voter approval; and
5. Subchapter M simply limits counties with zoning powers from prohibiting use of a home for "cottage food production operations."

COUNTY REGULATION OF SUBDIVISIONS

Texas Local Gov't Code Chapter 232 sets forth the authority of counties to regulate the subdivision of land, including certain limitations on that authority and, in some cases, how that authority is impacted by municipal ETJ powers over the same lands.

Texas Local Gov't Code § 232.001 authorizes county approval of plats and § 232.002 authorizes counties to deny plats that do not "meet the requirements prescribed by or under this chapter…".

Section 232.003 describes what a county may require during the plat approval process, including: required right-of-way, road widths, construction and drainage standards, purchaser notice of water availability, bonding requirements, and lot/block monumentation recordation.

Additional subdivision standards applied to Texas counties include:

1. §232.0032 – use of groundwater
2. §232.0033 – subdivisions proposed within future transportation corridors
3. §232.0034 – emergency access (1,000 or more lots)
4. §232.006 – exceptions for counties with a population of more than 3.3 million or contiguous to same
5. §232.007 – regulation (minimum infrastructure standards) of manufactured home rental communities
6. § 232.071, et seq. – platting requirements for certain economically distressed counties

Of note, is that Section 232.101, et seq., of this chapter authorizes "certain urban counties" to adopt rules governing plats and subdivisions related to "infrastructure planning provisions." However, the Policy Committee reported during the JLUS that none of the counties involved in the Joint Land Use Study are considered "urban." Regardless, as Tex. Local Gov't Code § 242.001 does with respect to municipal subdivision authority, § 232.101(b) prohibits exercise of authority under this section as it would relate to:

1. the use of any building or property for business, industrial, residential, or other purposes;
2. the bulk, height, or number of buildings constructed on a particular tract of land;
3. the size of a building that can be constructed on a particular tract of land, including without limitation any restriction on the ratio of building floor space to the land square footage;
4. the number of residential units that can be built per acre of land;
5. a plat or subdivision in an adjoining county; or
6. road access to a plat or subdivision in an adjoining county.

As is the case with cities, county subdivision authority may be subject to applicable limitations proscribed by an agreement created under Tex. Local Gov't Code §§ 242.001 or .002.

Again, note that Chapter 242 describes shared city-county jurisdiction related to subdivision control in a city's ETJ, and, as with municipalities, Tex. Local Gov't Code § 232.0015 limits the counties' authority to regulate certain subdivisions of land. Note that it is only within a city's ETJ that a municipality may annex unincorporated lands.

OUTDOOR LIGHTING

Subchapter B of Tex. Local Gov't Code Chapter 240, "Outdoor Lighting Near Observatories and Military Installations," authorizes certain counties to regulate outdoor lighting to prevent interference with military installations. However, in order to act under this authority, a county must either (a) have a population of greater than one million and host at least five (5) military installations; or (b) be adjacent to such a county and within five (5) miles of the installation. Tex. Local Gov't Code § 240.032(b-1). None of the counties participating in the JLUS meet this requirement.

However, if the authority were extended to the counties near Fort Hood, it would allow them to adopt orders that would "…protect against the use of outdoor lighting in a way that interferes with … military and training activities of the military installation, base or camp." These protections would include restrictions on incompatible lighting, shielding, and times of use. Outdoor lighting, for purposes of this authority, means "any type of fixed or movable lighting equipment that is designed or used for illumination out of doors. The term includes billboard lighting, street lights, searchlights and other lighting used for advertising purposes, and area lighting. The term does not include lighting

AIRPORT COMPATIBILITY GUIDELINES

In 2003, the Texas Department of Transportation issued a report entitled "Compatibility Planning, Compatible Land Use Zoning, Hazard Zoning for Airports in Texas." This report, though slightly outdated, includes useful guidance for establishing a Joint Airport Zoning Board, including:

- **Sample City Ordinances**
- **Sample County Orders**
- **Procedural & Administrative Forms**

equipment that is required by law to be installed on motor vehicles or lighting required for the safe operation of aircraft." Tex. Local Gov't Code § 240.031(2).

ADDITIONAL COMBINED MUNICIPAL AND COUNTY REGULATORY POWERS

REGULATIONS AROUND AIRPORTS

With respect to military air operations, cities and counties adjacent to Fort Hood or within a designated area impacting or impacted by air operations may adopt airport overlay zoning to maintain land use compatibility near the post, as they could be affected by air operations. There are two statutory means by which this may be accomplished.

Chapter 241 of the state Local Government Code authorizes the adoption of "airport hazard areas" and "controlled compatible land areas" through zoning around airports, including military airports, Tex. Local Gov't Code §§ 241.003, .004, and applies to both cities and counties, Tex. Local Gov't Code § 241.003. Chapter 241 is known as the "Texas Airport Zoning Act," or the "AZA." This authority, according to the Texas DOT's Airport Compatibility Guidelines, includes the creation of airport hazard areas over county lands that are not otherwise subject to zoning. This area of regulation includes restrictions on physical obstructions into military airspace, as well as land use compatibility on lands experiencing potential air operation effects.

PHYSICAL OBSTRUCTIONS

"Airport hazard areas" protect airports from structures and objects that may obstruct airspace or interfere with radar and other air traffic control technology. Airport hazard areas are designated by the local government, but are generally considered to be consistent with the imaginary surfaces described by the Federal Aviation Regulations (FAR) Part 77. See Airport Compatibility Guidelines, p. 26.

According to the Texas AZA, however, "airport hazard areas" include any lands "on which an airport hazard could exist," and

"airport hazards" are defined as a "structure or object of natural growth that obstructs the air space required for the taking off, landing, and flight of aircraft or that interferes with visual, radar, radio, or other systems for tracking, acquiring data relating to, monitoring, or controlling aircraft." Tex. Local Gov't Code § 241.003(2)&(3). And, FAR Part 77.28, "Military Airport Imaginary Surfaces," describes the surfaces associated specifically with military airports.

Cities and counties adopting airport hazard area regulations may divide an airport hazard area into zones and, therein, may:

1. specify the land uses permitted;
2. regulate the type of structure; and
3. restrict the height of structures and objects of natural growth to prevent the creation of an obstruction to flight operations or air navigation.

Tex. Local Gov't Code § 241.011.

As is discussed in Chapter X, the City of Killeen has adopted airport hazard area zoning at Skylark Field, related to the former "Killeen Municipal Airport," pursuant to the Texas AZA.

LAND USE COMPATIBILITY

In addition, the Texas AZA allows cities and counties to regulate land use in the vicinity of airports, including military airports, to maintain "compatible land use" in the area, which is defined as "a use of land adjacent to an airport that does not endanger the health, safety, or welfare of the owners, occupants, or users of the land because of levels of noise or vibrations or the risk of personal injury or property damage created by the operations of the airport, including the taking off and landing of aircraft." Tex. Local Gov't Code § 241.003(6).

These zoned areas, known as "controlled compatible land use areas" (CCLUA) cannot extend further than 1.5 statute miles from the centerline of a runway and five miles from the ends of an "instrument or primary" runway.

Cities and counties adopting compatible land use zoning typically identify the areas of impact within the CCLUA that should be regulated (likely for accident potential and noise impacts) and likely would not regulate the entire area unless an airport master plan, operational noise management plan, or other technical study has indicated the presence of military air impacts to that geographic extent.

It is within these areas of impact that the local government would identify land uses that are incompatible with airport operations and would describe mitigation techniques necessary to maintain or increase compatibility (e.g. noise level attenuation construction standards for residences).

Finally, political subdivisions "with a population of more than 45,000 in which an airport is used in the interest of the public to the benefit of the political subdivision is located" may adopt, administer, and enforce airport hazard and airport compatible land use zoning extraterritorially, as well. Tex. Local Gov't Code

§ 241.013. For example, the city of Killeen, as it has a population over 45,000, could extend its overlay authority extraterritorially under existing statutory authorities within mapped airport hazard and controlled compatible land use areas. However, the Policy Committee preferred a cooperative approach that would either involve the consent of any affected county or the statutory alternative of a "joint" approach engaging the cities and counties expressly as partners in airport zoning regulations affecting all incorporated and unincorporated lands. A discussion of this preferred approach follows.

JOINT AIRPORT ZONING BOARDS

Where more than one political subdivision is affected, multiple jurisdictions may create joint airport zoning boards by resolution or ordinance to carry out the powers granted by sections 241.011 and .012. Tex. Local Gov't Code § 241.014(a). In fact, from 1987 to 2015, a "joint airport zoning board," or "JAZB," was in place with respect to the former Killeen Municipal Airport and included members appointed by the City of Killeen, Harker Heights, and Bell County. However, in November of 2015, the Killeen City Council repealed the ordinances creating the JAZB and simply established a airport zoning commission for the city only and only with respect to Skylark Field at the Killeen Fort Hood Regional Airport.

However, as is shown in Table 1 ("Impacts by Jurisdiction"), the airport hazard, noise, or accident potential zones associated with Fort Hood's existing airfields extend over Coryell County, Killeen, Copperas Cove, and Harker Heights.

The steps to form a JAZB that would include those military impact areas and each of the local jurisdictions within the airport hazard and compatible land use areas generally are as follows:

1. Each city and county would, by resolution or ordinance, authorize creation of the JAZB and appoint two (2) members to the JAZB (if a state agency owns and operates an airport, that agency is entitled also to have two (2) appointed members) (§ 241.014);
2. Elect a chairperson by majority vote of the appointed JAZB members (§ 241.014(c));
3. Designate an agency (like the City of Killeen) to administer the airport zoning regulations and the JAZB procedures (§ 241.031)
4. Establish a board of adjustment for the airport zoning regulations, which may be an existing zoning board of appeals or adjustment (§ 241.032 - .036)
5. Establish application forms and processes, applicable fees, and other necessary administration elements
6. JAZB to hold a public hearing regarding adoption of the "joint" airport zoning regulations (§ 241.017)
7. Adopt airport zoning regulations and a map of the applicable airport hazard and compatible land use areas addressing obstructions, height, impermissible land uses (based on safety and noise impacts, light obstructions), and nonconforming uses, within statutory guidelines.

REAL ESTATE DISCLOSURES

Title 2, Chapter 5 of the Texas Property Code addresses real property transfers: required elements, processes, and disclosures. Tex. Local Gov't Code § 5.008 sets out the items that must be included in transfers of single-family residential real property and includes a disclosure form that must be provided to the purchaser as it is presented in the statute, or in a "substantially similar" form. Of the listed potential disclosure items, none includes "military impacts," although a general question asked is whether there is "[a]ny condition on the property which materially affects the health or safety of an individual." Tex. Local Gov't Code § 5.008(b).

As in most states today, Texas' Real Estate Commission provides a form titled "Seller's Disclosure of Property Condition," which was most recently amended on August 17, 2015. Form 1506, "General Information and Notice to Buyers," informs potential buys of environmental conditions, soil conditions, flood hazards, historic and conservation districts, and other matters related to the nature of the area. Noise is addressed in general terms as follows:

> "Noise. Properties around the property you may buy are used for a variety of purposes. Some of the uses cause noise (for example, airports, railways, highways, restaurants, bars, schools, arenas and construction). You are encouraged to drive to review the area around the property in which you are interested at various times and days."

See Texas Association of Realtors, Sample Form TAR-1506, dated March 2, 2012, p. 1.

Legislation introduced during the 2015 session of the Texas Legislature would have required the seller of certain residential properties to provide the purchaser with written disclosure of the fact that the property could be located near a military installation and could be affected by high noise or air installation compatible use zones or other operations. A version of the bill passed the House and a Senate Committee, but no vote was taken by the Senate. The following is an excerpt from a version of the House bill that was under consideration:

> *This property is located within three miles of a military installation that includes an airport. The seller has reviewed publically available information provided as required by Section 397.007, Local Government Code, and identified the designation status of the property based on that information as follows:*
>
> Write Yes (Y) or No (N) to each:
>
> ___ Accident potential zone
>
> ___ Clear zone
>
> ___ High-noise zone

Although no legislation for real estate disclosure was passed in the 2015 session, during the Joint Land Use Study, the Legislature continued to discuss real estate disclosure legislation and

the issue remained as a central charge of the Committee on Defense and Veterans Affairs.

Required disclosures would increase future citizens' awareness of noise, vibration, safety, lighting limitations, and other military impacts that could affect use of the property. With this increased awareness, there may be a reduced likelihood of future complaints related to these impacts.

USE OF UNMANNED AIRCRAFT

Civilian use of unmanned aircraft operations near Fort Hood could impact mission operations at the post. Chapter 423 of the Texas Government Code addresses the use of unmanned aircrafts and proscribes certain unlawful uses of these aircraft, commonly referred to as "drones." The popularity of drones by civilian users has exploded in recent years and is triggering increased concerns near military installations. However, at this time, their use by civilian hobbyists and commercial users is governed by the Federal Aviation Administration.

On June 21, 2016, during the Joint Land Use Study, the FAA released the Final Small Unmanned Aircraft Rule, which was the first operating rule for commercial-use drones. The rule limited unmanned aircraft systems (UAS) to less than 55 pounds and their maximum use to 400 feet above ground level (AGL). The rule also required that the remote pilot in control must have a remote pilot certificate, and that Air Traffic Control (ATC) must be notified before operating a UAS in Class B, C, D, or E airspace. See Federal Aviation Administration, "Summary of Small Unmanned Aircraft Rule (Part 107)," June 21, 2016.

It is generally expected that this new rule, which relaxed previously-existing user requirements, will increase – perhaps significantly – the use of civilian unmanned aircraft systems. In fact, when the rule was passed, the FAA estimated its passage could generate more than $82 billion for the United States economy and create more than 100,000 jobs over the subsequent 10 years.

MILITARY-SPECIFIC STATUTORY AUTHORITIES AND REQUIREMENTS

COORDINATION RELATED TO LOCAL GOVERNMENT "ORDINANCES, RULES, AND PLANS"

Chapter 397, Tex. Local Gov't Code, requires "defense communities" ("… a municipality, county, or special district, that is adjacent to, is near, or encompasses any part of a military base or defense facility," § 397.01(1)) to coordinate with military officials prior to taking final action when an "ordinance, rule, or plan proposed by the community may impact a military base or defense facility or the military exercise or training activities connected to the base or facility…" (emphases added). See Tex. Local Gov't Code § 397.005(a).

Therefore, the local governments adjacent to, near, or encompassing Fort Hood should coordinate with the post before making final decisions on city or county ordinances, rules, or plans that may impact Fort Hood training activities. It appears

that cities and counties have some discretion in determining to which governmental activities this requirement applies. As is discussed in Chapter XX, although most do so informally, none of the cities or counties participating in the JLUS have formalized protocols to ensure compliance with § 397.005(a).

COORDINATION RELATED TO PROPOSED "STRUCTURES"

In addition, defense communities that include a municipality with a population of greater than 110,000, located in a county with fewer than 135,000, that have not adopted airport zoning, must notify the base when a permit for a structure is sought within eight (8) miles of the base or facility "concerning the compatibility of the proposed structure with base operations" (emphasis added). Tex. Local Gov't Code § 397.006 (a) and (b).

However, based on the population requirements in the Code, this section requiring notice related to certain proposed structures does not apply to any of the jurisdictions that participated in the JLUS. However, if a home rule city were to coordinate nonetheless with respect to proposed structures, the statutory definition of what constitutes a "structure" may be informative.

Texas Local Gov't Code § 245.001 defines a permit as:

> a license, certificate, approval, registration, consent, permit, contract or other agreement for construction related to, or provision of, service from a water or wastewater utility owned, operated, or controlled by a regulatory agency, or other form of authorization required by law, rule, regulation, order, or ordinance that a person must obtain to perform an action or initiate, continue, or complete a project for which the permit is sought.

There is an exception to the statutory notice requirement when a defense community must take "immediate action" to protect the public health, safety, or welfare of its residents." Tex. Local Gov't Code § 397.006(d).

STATUTORY FRAMEWORK FOR SUSTAINING AND SUPPORTING MILITARY INSTALLATIONS IN TEXAS

MILITARY PLANNING AND REVOLVING LOAN FUND

Chapter 397 also describes several planning processes that defense communities must or may undertake related to military planning, typically in the framework of seeking or using Texas military value revolving loan funds administered by the Texas Military Preparedness Commission (discussed below).

The planning processes and documents include:

1. Military base or defense facility value enhancement statements (see Tex. Local Gov't Code § 397.002)
2. Defense community economic redevelopment value statements (see Tex. Local Gov't Code § 397.0021)
3. Comprehensive defense community strategic impact plans and planning manuals (see Tex. Local Gov't Code §§ 397.003 and .004). "Comprehensive Defense

Community Strategic Plans" set forth the community's goals and proposals for:

- Controlling negative impacts of growth
- Minimizing encroachment
- Enhancing military value
- Potential shared services

The Plan should also include:

- Land Use Element
- Transportation Element
- Population Growth Element
- Water resources Element
- Conservation Element
- Open Space Element
- Restricted Airspace Element
- Military Training Route Element

Tex. Local Gov't Code § 397.003.

Defense communities that prepare a "strategic impact plan" are encouraged, thereafter, to develop, "in coordination with the authorities of each military base or defense facility associated with the community," a planning manual to guide implementation of the strategic impact plan. Tex. Local Gov't Code § 397.004.

REGIONAL MILITARY SUSTAINABILITY COMMISSIONS

In addition, Chapter 397A authorizes the creation of "regional military sustainability commissions" in certain qualified communities. With this authority, the Texas Legislature recognized the importance of maintaining compatible land uses in the vicinity of the state's military installations.

The purpose of the statute is to:

1. promote the public health, safety, and general welfare;
2. protect and preserve places and areas of military and national security importance and significance;
3. protect critical military missions and operations related to those missions; and
4. ensure state and national security.

Tex. Local Gov't Code § 397A.001(b).

Subchapter B, of § 397A applies to "populous areas" and, by its terms, would not apply to the jurisdictions participating in the JLUS. See Tex. Local Gov't Code § 397A.052.

Subchapter C, on the other hand, applies to "less populous areas," which are defined as:

> a county with a population of 60,000 or less and a municipality that, with respect to the same active military installation, constitutes a defense community, as defined by Section 397.001.

Once again, this section does not apply to the counties and cities participating in the JLUS, as both Coryell County and Bell County have populations that exceed 60,000. Were this authority to be expanded to include the local jurisdictions, they

could agree by order, ordinance, or other means to certain cooperation, coordination, funding and mission protection efforts.

TEXAS MILITARY PREPAREDNESS COMMISSION

As previously discussed, Chapter 436 of the Texas Government Code establishes the Texas Military Preparedness Commission (TMPC) under the office of the Governor. According to the state's website, the TMPC "advises the governor and the legislature on ways to strengthen the position of Texas military installations in preparation for a potential BRAC and other defense-related issues. The commission is composed of 13 members serving 6 year staggered terms, typically representing an installation in their community."

House Bill 1133, in 2015, included the adjutant general among the ex officio members of the Texas Military Preparedness Commission (the other two ex officio members are representatives of each chamber of the Texas Legislature having primary jurisdiction over defense-related matters). The Fort Hood area representative to the TMPC, at the time of the JLUS, was Mr. William Shine, from Harker Heights.

Funding opportunities are available through the TMPC, including the Texas Military Revolving Loan account. See Tex. Local Gov't Code § 436.156. Loans have been created for community economic development projects that will enhance military value (§ 436.153). Funds also are authorized for communities adversely affected by defense base reductions (§ 436.1531), and for installations positively affected by base restructuring (§ 436.1532). Note that the 2015 legislature also abolished the Military Base Realignment and Closure Task Force, and the remaining portions of § 436.105 will now expire on September 1, 2019. See SB 1358 (2015).

In addition, under Subchapter E, of Chapter 436, municipal and county "defense communities," among others, are eligible for grants where the TMPC determines that "the entity may be adversely or positively affected by an anticipated, planned, announced, or implemented action of the United States Department of Defense to close, reduce, increase, or otherwise realign defense worker jobs or facilities."

Finally, since 1997, the TMPC also has administered "Defense Economic Adjustment Assistance Grants" (DEAAG), which "assist defense communities that have been positively or negatively impacted by a change in defense contracts or an announced change. Funding can also be used proactively to support installations in the event of a change or announced change by the Department of Defense." *Website of the Office of the Governor Greg Abbott, visited April 11, 2016.*

RENEWABLE ENERGY DEVELOPMENT

At the time of the Joint Land Use Study, the Legislature had not adopted legislation related to the impacts of renewable energy development on military installations in the state. However,

the solar and wind industries were growing rapidly at that time and the concern over their impact on military training and sustainability in the state were increasing.

Discussions were being held relating to legislation that could be introduced to avoid conflicts between renewable energy developers and Department of Defense installations in the state. Among the legislative approaches being discussed at the time were:

1. early notification and coordination between the military and energy developers;
2. joint land use studies;
3. restrictions on tax abatements otherwise available to developers near military bases; and
4. agreements between the military and energy developers.

The next legislative session following completion of the JLUS is January of 2017.

5.5 LOCAL GOVERNMENT PLANS AND ORDINANCES

As part of the study, the Technical and Policy Committees reviewed existing local government legislation and comprehensive plans in order to fully understand how land use compatibility between civilian land uses and operations at Fort Hood currently are being handled. This effort included, for each participating city and county, a review of local codes, zoning regulations, subdivision ordinances and comprehensive plans.

OVERVIEW

Table 5.2, "Overview of Local Legislation and Comprehensive Plans," summarizes the extent to which or whether each local government has addressed military compatibility in their comprehensive plans or regulatory codes. Map 5.1 displays where the jurisdictional authority of each community applies within the 3 mile study area. The pages that follow detail the information summarized in Table 5.2.

First, Fort Hood and its surrounding local governments have a long history of coordinating on land use matters as they have arisen. This has resulted in a landscape with very few compatibility or encroachment concerns to date. In addition to land use planning matters, the culture in this area reflects Fort Hood's long-standing presence in the community and the community's dedication to its sustainability. Many active and retired military personnel remain involved in community activities and civic organizations. Understandably, formal mechanisms for requiring coordination have largely not been necessary given this culture of cooperation.

Second, the review of existing plans and regulations indicated that several tools other defense communities have used to ensure ongoing mission sustainment have not been formally adopted here but may be of benefit. One of these tools potentially includes participation by Fort Hood officials on local planning and zoning commissions, formalizing coordination with Fort Hood on local land use decisions (§ 397.005(a) which

requires coordination), and consideration of zoning overlays to address air- and weapons-training activities that can have off-post impacts within the community.

The Joint Land Use Study provides an opportunity to explore measures for achieving even better coordination, formalizing existing protocols and solidifying the protection of Fort Hood's operations and presence into the future. That objective guides the JLUS process, of course, and has informed this overview of local legislation and plans.

COUNTIES

Pursuant to Texas statutory framework, Bell County and Coryell County do not have zoning ordinances, have not adopted comprehensive plans, and do not enforce building construction codes. However, each has adopted subdivision regulations, which, by statute do not address matters related to land use compatibility and operations at Fort Hood.

BELL COUNTY

In 2001, Bell County adopted the "Bell County Thoroughfare Plan: An Integrated Plan for 2001-2025," which documented existing conditions related to roadways and transportation issues in the County and laid out recommendations for the County and region as the area continued to grow. The prior thoroughfare plan had been prepared in 1984.

The 2001 plan recommended:

1. enhancing coordination between the county and incorporated cities to develop a seamless transportation plan for the region;
2. evaluate future traffic volumes and levels of service on thoroughfares carrying traffic within and through the county;
3. determine mechanisms to meet growing highway demand;
4. identify maintenance needs and priorities;
5. present land use strategies designed to have positive impacts on the county's road infrastructure.

Also in 2001, Bell County adopted subdivision regulations pursuant to its authorities under Chapter 232 of the Tex. Local Gov. Code, which authorities are detailed in the previous section. The subdivision regulations apply in the unincorporated areas of Bell County as well as the ETJs of the cities within the County. The County entered into an Interlocal Government Agreement with Copperas Cove in 2002 to address the scope of each jurisdiction's subdivision authorities within the ETJ.

Bell County subdivision regulations require a preliminary and final plat and, if appropriate, a concept plat for purposes of discussing the aspects of the intended subdivision with the County Engineer prior to subdividing. See County of Bell Subdivision Regulations, § 202. If a proposed plat is located within the ETJ of a city, that city's approval of the preliminary plat must occur

▼ TABLE 5.1: IMPACTS BY JURISDICTION*

		Green Highlighting Indicates Presence of Potential Military Impacts	Fort Hood	Bell County **	Coryell County **	Killeen	Copperas Cove	Harker Heights
Related to Air Operations	Noise	**Aviation Noise - Robert Gray AAF (Existing Runway)**						
		65-74	Yes	No	No	ETJ	No	No
		75+	Yes	No	No	No	No	No
		Aviation Noise - Robert Gray AAF (Proposed Runway)						
		65-74	Unknown	Unknown	Unknown	Unknown	Unknown	No
		75+	Unknown	Unknown	Unknown	Unknown	Unknown	No
		Aviation Noise - Hood AAF						
		65-74	Yes	No	No	No	No	No
		75+	Yes	No	No	No	No	No
	Accident Potential	**Aviation Accident Potential - Robert Gray AAF (Existing Runway)**						
		CZ	Yes	No	No	No	No	No
		APZ 1	Yes	No	No	No	No	No
		APZ 2	Yes	No	No	ETJ	No	No
		Aviation Accident Potential - Robert Gray AAF (Proposed Runway)						
		CZ	Yes	No	No	ETJ	No	No
		APZ 1	Yes	No	No	ETJ	No	No
		APZ 2	Yes	No	No	ETJ	No	No
		Aviation Accident Potential - Hood AAF						
		CZ	Yes	No	No	No	No	No
		APZ	Yes	No	No	No	No	No
	Obstruction Risk	**Airport Hazard Area/Imaginary Surfaces - Robert Gray AAF (Existing Runway)**						
			Yes	No	Yes	Inc/ETJ	Inc/ETJ	No
		Airport Hazard Area/Imaginary Surfaces - Robert Gray AAF (Proposed Runway)						
			Unknown	Unknown	Unknown	Unknown	Unknown	No
		Airport Hazard Area/Imaginary Surfaces - Hood AAF						
			Yes	No	No	Inc	No	Inc
Related to Other Training Operations	Impulsive Noise	**Large Caliber Weapons Training**						
		115 dB PK 15 (Mod Complaint Risk)	Yes	Yes	Yes	Inc/ ETJ	No	No
		130 dB+ PK 15 (High Complaint Risk)	Yes	No	Yes	No	No	No
		Small Caliber Weapons Training						
		87-104 dB PK 15	Yes	No	Yes	Inc	Inc	No
		104 dB+ PK 15	Yes	No	No	Inc	Inc	No
	Miscellaneous	**Outdoor Lighting Impacts**						
			Yes	Yes	Yes	Inc/ETJ	Inc/ETJ	Inc/ETJ
		Renewable Energy						
		Aviation Hazard	Yes	Yes	Yes	Inc/ETJ	Inc/ETJ	Inc/ETJ
		Interference Encroachment (Radar)	Yes	Yes	Yes	Inc/ETJ	Inc/ETJ	Inc/ETJ
		Coordination						
		Proposed Development Applications (incl. Subdivisions)	Yes	Yes	Yes	Yes	Yes	Yes
		Renewable Energy Projects	Yes	Yes	Yes	Yes	Yes	Yes
		Growth-Inducing Infrastructure	Yes	Yes	Yes	Yes	Yes	Yes

Footnotes: *For Municipalities: Inc = Incorporated Lands Only; ETJ = Lands in ETJ Only; Inc/ETJ = Incorporated Lands and Lands in the ETJ.
**Indicates presence of impacts within a portion of a county that is not within a city's ETJ.

▼ TABLE 5.1: IMPACTS BY JURISDICTION* (CONTINUED)

		Green Highlighting Indicates Presence of Potential Military Impacts	Nolanville	Temple	Belton	Gatesville	Non-JLUS Jurisdictions Under Air Corridors
Related to Air Operations	Noise	**Aviation Noise - Robert Gray AAF (Existing Runway)**					
		65-74	No	No	No	No	No
		75+	No	No	No	No	No
		Aviation Noise - Robert Gray AAF (Proposed Runway)					
		65-74	No	No	No	No	No
		75+	No	No	No	No	No
		Aviation Noise - Hood AAF					
		65-74	No	No	No	No	No
		75+	No	No	No	No	No
	Accident Potential	**Aviation Accident Potential - Robert Gray AAF (Existing Runway)**					
		CZ	No	No	No	No	No
		APZ 1	No	No	No	No	No
		APZ 2	No	No	No	No	No
		Aviation Accident Potential - Robert Gray AAF (Proposed Runway)					
		CZ	No	No	No	No	No
		APZ 1	No	No	No	No	No
		APZ 2	No	No	No	No	No
		Aviation Accident Potential - Hood AAF					
		CZ	No	No	No	No	No
		APZ	No	No	No	No	No
	Obstruction Risk	**Airport Hazard Area/Imaginary Surfaces - Robert Gray AAF (Existing Runway)**					
			No	No	No	No	No
		Airport Hazard Area/Imaginary Surfaces - Robert Gray AAF (Proposed Runway)					
			No	No	No	No	No
		Airport Hazard Area/Imaginary Surfaces - Hood AAF					
			No	No	No	No	No
Related to Other Training Operations	Impulsive Noise	**Large Caliber Weapons Training**					
		115 dB PK 15 (Mod Complaint Risk)	No	ETJ	No	Inc/ETJ	No
		130 dB+ PK 15 (High Complaint Risk)	No	No	No	No	No
		Small Caliber Weapons Training					
		87-104 dB PK 15	No	No	No	No	No
		104 dB+ PK 15	No	No	No	No	No
	Miscellaneous	**Outdoor Lighting Impacts**					
			Inc/ETJ	Inc/ETJ	Inc/ETJ	Inc/ETJ	No
		Renewable Energy					
		Aviation Hazard	Inc/ETJ	Inc/ETJ	Inc/ETJ	Inc/ETJ	No
		Interference Encroachment (Radar)	Inc/ETJ	Inc/ETJ	Inc/ETJ	Inc/ETJ	Yes
		Coordination					
		Proposed Development Applications (incl. Subdivisions)	Yes	Yes	Yes	Yes	No
		Renewable Energy Projects	Yes	Yes	Yes	Yes	Yes
		Growth-Inducing Infrastructure	Yes	Yes	Yes	Yes	No

Footnotes: *For Municipalities: Inc = Incorporated Lands Only; ETJ = Lands in ETJ Only; Inc/ETJ = Incorporated Lands and Lands in the ETJ.
**Indicates presence of impacts within a portion of a county that is not within a city's ETJ.

▼ TABLE 5.2: OVERVIEW OF LOCAL LEGISLATION AND COMPREHENSIVE PLANS

	Zoning			Subdivision			Building		Comprehensive Planning		Other			
Jurisdiction	Jurisdictional Zoning	Airport Zoning	Military-Related Zoning Regs[1]	Jurisdictional Subdivision Regulations	Extraterritorial Jurisdiction (per State Code)	Military-Related Subd Regs[1]	Building Codes (Intn'l Code Yr)	Noise Attenuation for Aircraft	Jurisdictional Planning	Military-Related Plan Policies[2]	Outdoor Lighting Regulated[3]	Formal Land Use Coordination Protocol[4]	Home Rule	Form of Government
Counties														
Bell County	None	Yes	N/A	Yes	N/A	No	No	No	No	N/A	No	No	N/A	General Purpose
Coryell County	None	No	N/A	Yes	N/A	No	No	No	No	N/A	No	No	N/A	General Purpose
Cities														
Killeen	Yes	Yes	No	Yes	per § 2-3 City Code	Yes	Yes (2009)	Yes	Yes	Background, General	Yes	No	Yes	Council-Manager
Copperas Cove	Yes	No	No	Yes	2-mile	No	Yes (2009)	No	Yes	Background, General	No	No	Yes	Council-Manager
Harker Heights	Yes	No	No	Yes	2-mile	No	Yes (2015)	No	Yes	Background	Yes	No	Yes	Council-Manager
Nolanville	Yes	No	Yes	Yes	1.5-mile	No	Yes (2009)[5]	No	Yes	Background	Yes	No	Yes	Council-Manager
Temple	Yes	No	No	Yes	3.5-mile	No	Yes (2015)	No	Yes	Background	Yes	No	Yes	Council-Manager
Belton	Yes	No	No	Yes	1-mile	No	Yes (2009)[6]	No	Yes	No	Yes	No	Yes	Council-Manager
Gatesville	Yes	Yes	No	Yes	1-mile	No	Yes (2012)	No	No	N/A	No	No	Yes	Council-Manager

Notes

1 Whether regulations have been adopted which govern land uses that may be incompatible with military operations at Fort Hood

2 Describes the extent to which the Plan addresses Fort Hood's presence; whether as "Background" data only; "General" land use policies/coordination; or "Limitations" on land use to encourage/require

3 Whether adopted zoning or subdivision regulations address outdoor lighting characteristics; no jurisdiction has adopting outdoor lighting restrictions specifically intended to protect training operations at Fort Hood

4 Whether a formal mechanism for coordinating with Fort Hood on land use matters has been adopted through zoning, subdivision, intergovernmental/joint powers agreement, or other; it is noted that extensive coordination is occurring without formal or binding requirements for doing so

5 Nolanville uses the 2008 National Electric Code

6 Belton uses the 2011 National Electric Code

prior to submission of the plat to Bell County. Id. at § 203. If private lands are required to be dedicated for a public use, the County will first conduct a Takings Impact Assessment prior to final action, unless the applicant expressly waives this step. Id. at § 210. Areas addressed by the County subdivision regulations include lots and easements, building line setbacks, roads and utility easements, streets and drainage, minimum road design standards, sign and traffic control devices, and curb and gutter right-of-way.

Finally, in 2003, Bell County adopted certain requirements for manufactured home rental communities. See Bell County Infrastructure Requirements for Manufactured Home Rental Communities (2003). These require property owners in unincorporated Bell County to create an infrastructure development plan that complies with the provisions of these requirements. The County's manufactured home regulations do not address any matters related to Fort Hood.

CORYELL COUNTY

Coryell County adopted its most recent subdivision regulations in 2009. See Coryell County Subdivision Regulations (2009). The subject areas included in Coryell County's subdivision code are similar to those addressed in Bell County's and are based on the limited subdivision authorities set out in Chapter 232 of the Tex. Local Gov't Code.

Coryell County's subdivision code addresses public water systems, use of groundwater, lot design standards, number of units per lot, floodplain development, roadway setbacks, utility and drainage easements, roadway dedications and design, drainage, and manufactured home rental communities. As is the case in Bell County, Coryell County subdivision regulations do not address matters related to Fort Hood.

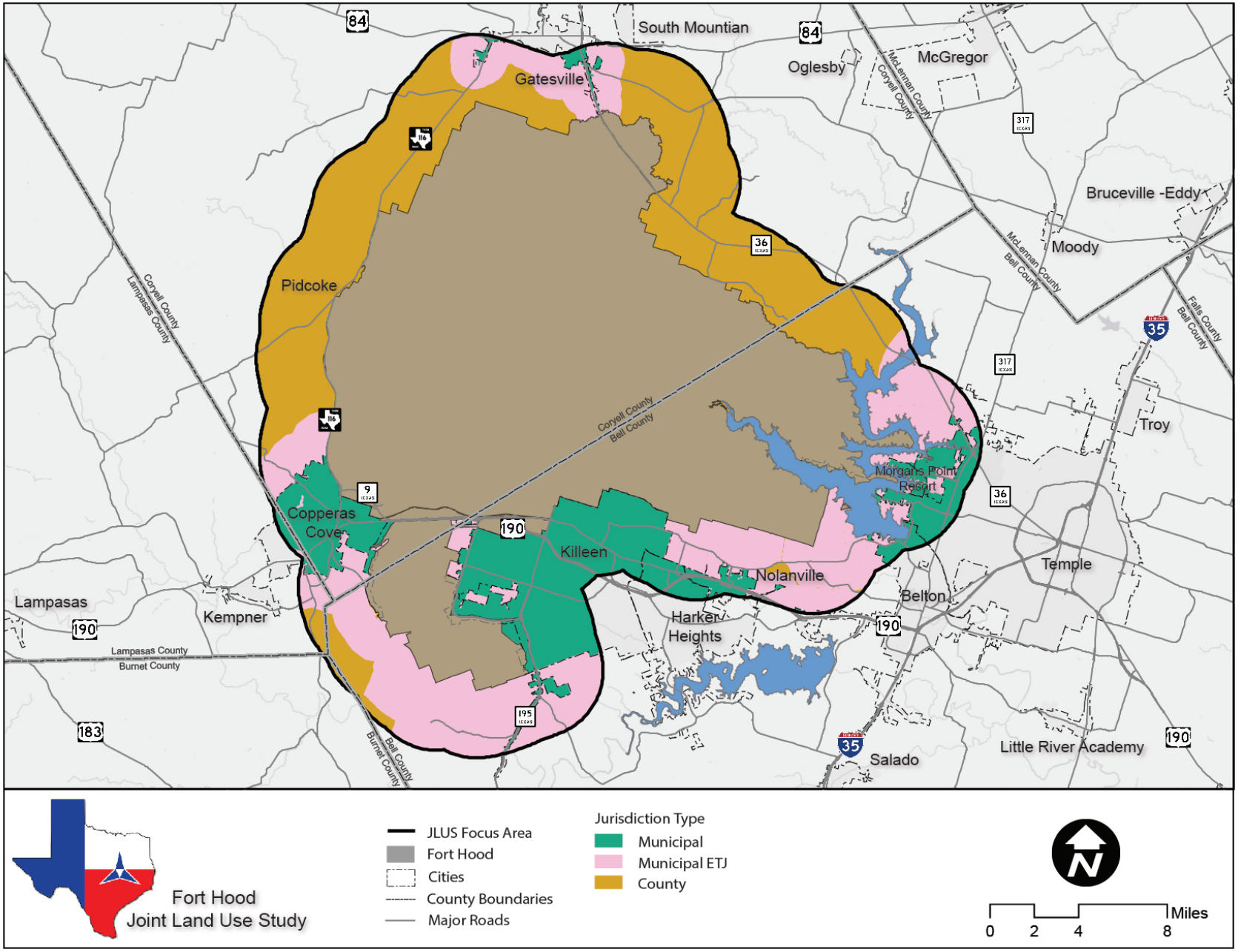
Coryell County includes the extraterritorial jurisdictions of both Copperas Cove and the City of Gatesville, with whom ETJ Interlocal Government Agreements have been executed, in 2002 and 2009 respectively.

Finally, Coryell County maintains an Economic Development Board, which finalized a marketing plan in 2015. See Coryell County Economic Development and Marketing Plan (Fall 2015). The plan "benchmarks" key demographics and performance measures and lays out recommendations for the near-term, long-term, and as ongoing. The fifth of six primary objectives is to:

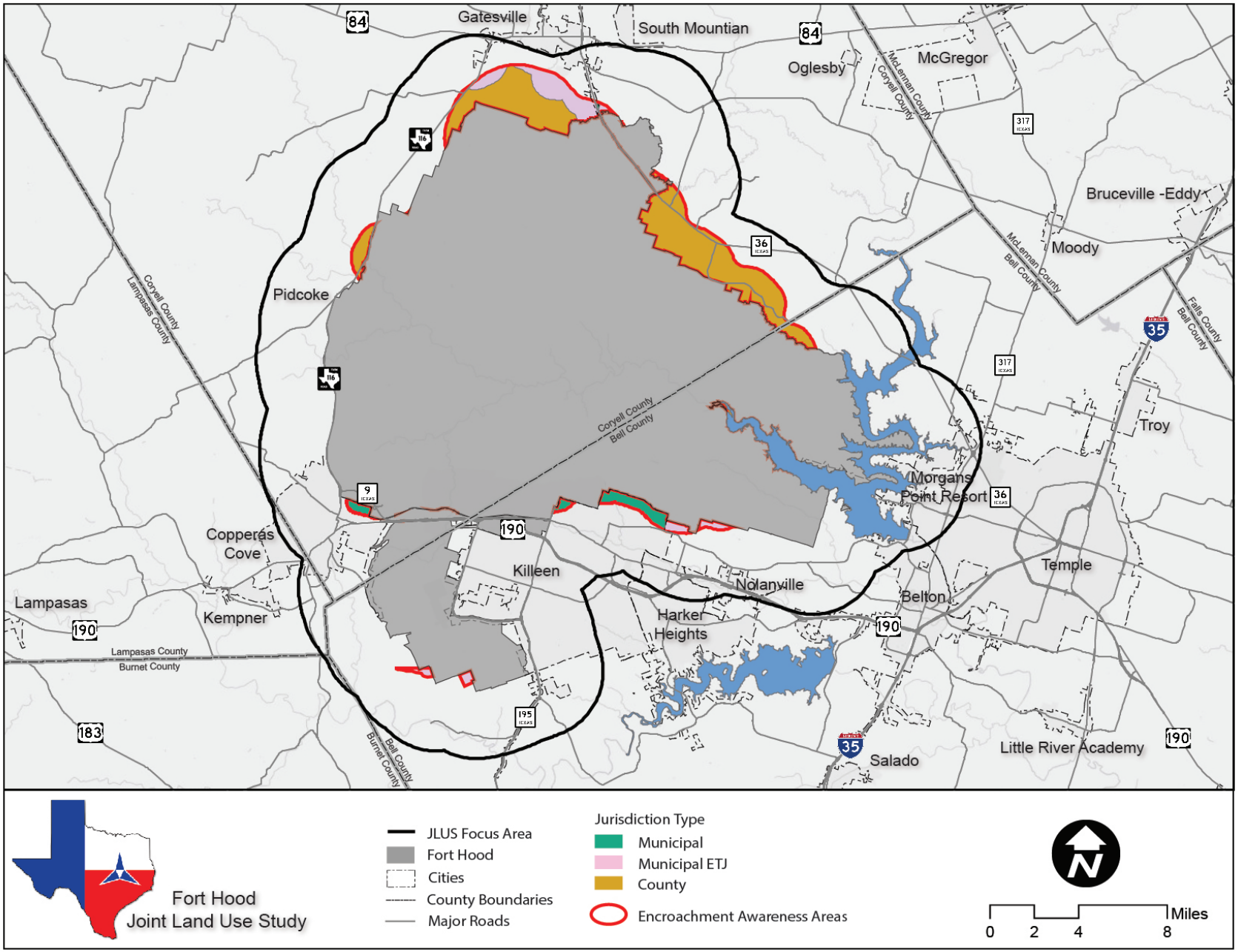
> Support the mission of Fort Hood and coordinate the County's economic development efforts to avoid encroachment and enhance complementary activities. See id., p. 8.

Indeed, the plan recognizes Fort Hood's economic significance, noting that the post occupies one-third of the land area of Coryell County and employees one-third of Coryell County's residents. Id. p. 5.

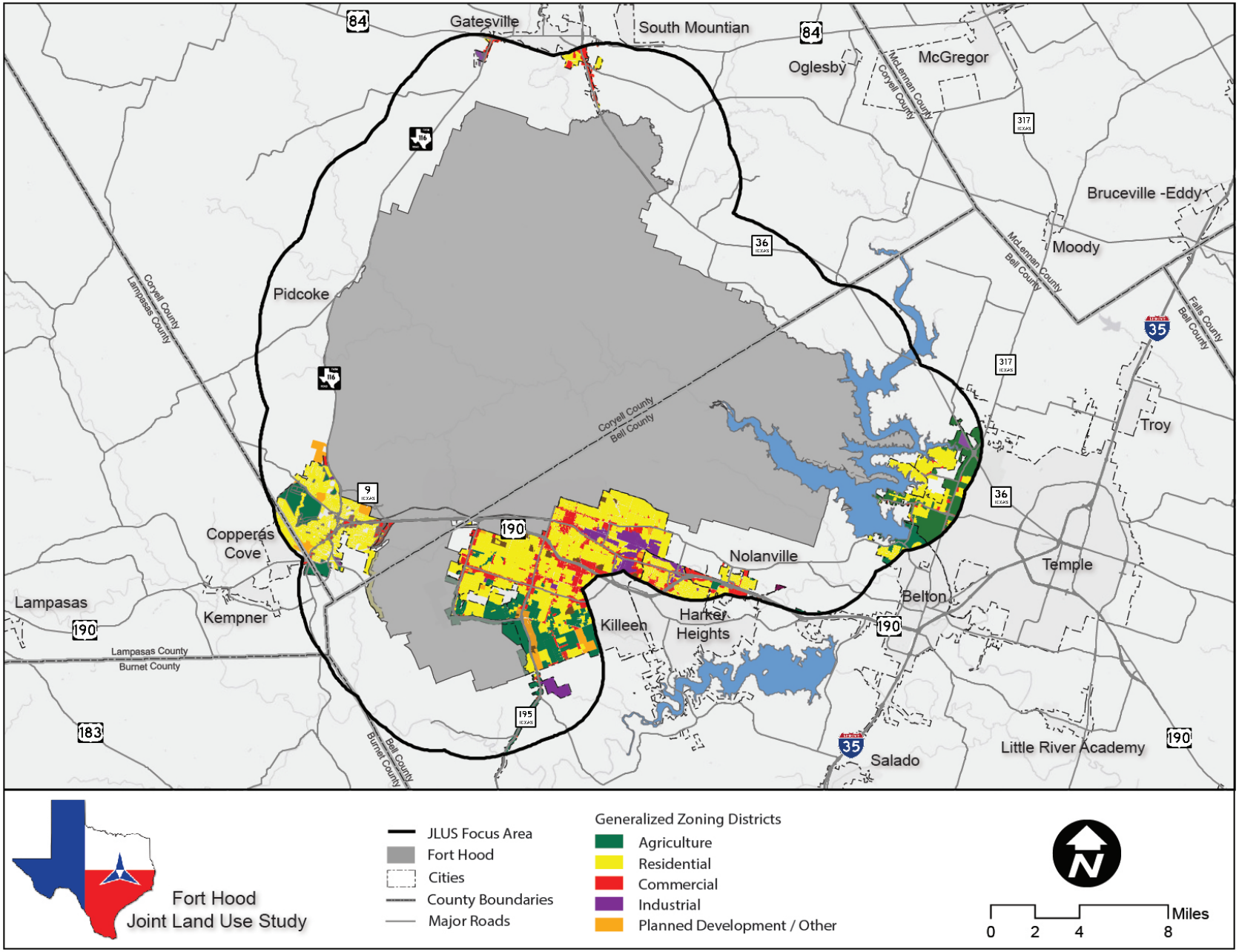
▼ MAP 5.1 JLUS FOCUS AREA JURISDICTIONAL STATUS



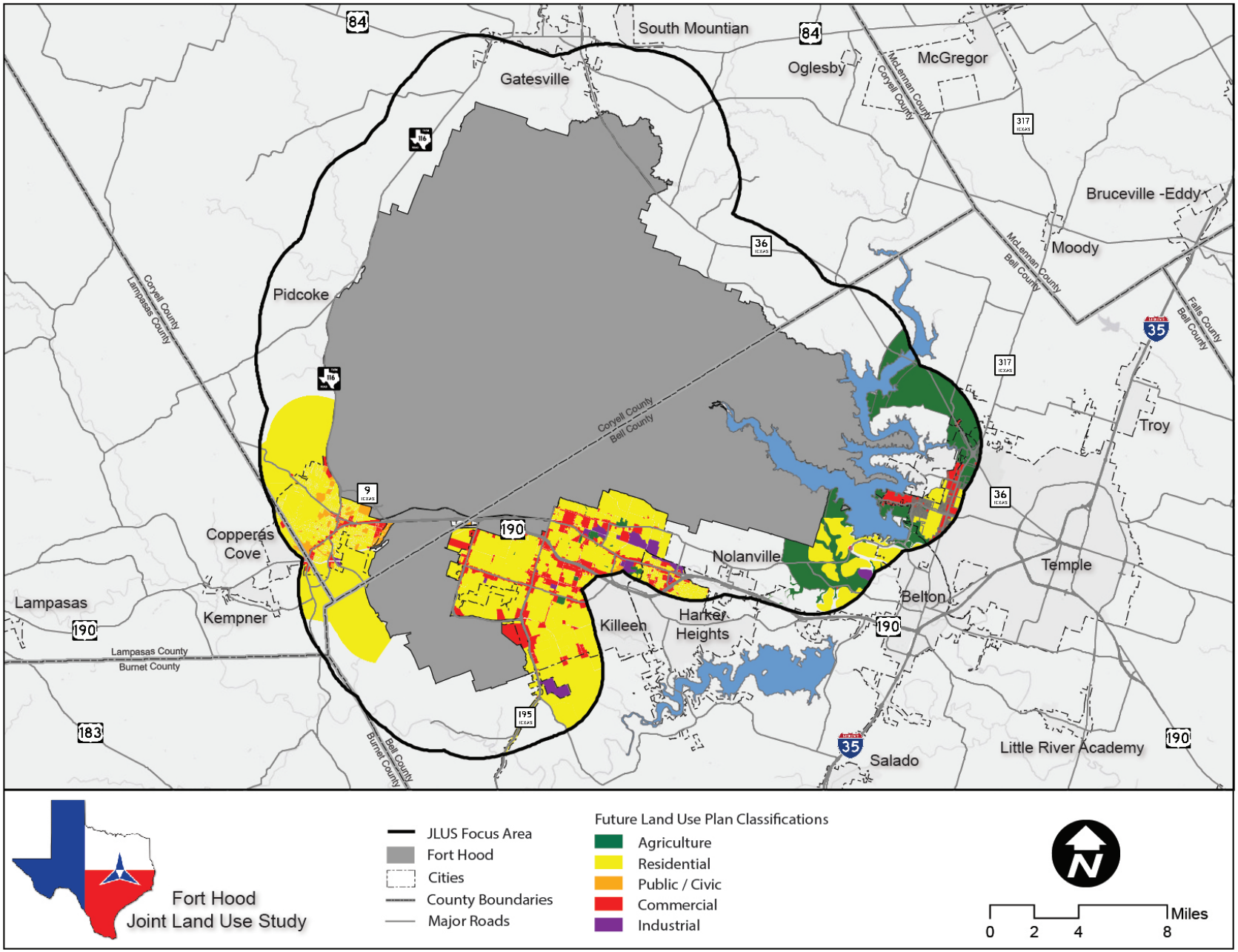
▼ MAP 5.2 JURISDICTIONAL STATUS WITHIN THE ENCROACHMENT AWARENESS AREA



▼ MAP 5.3 JLUS FOCUS AREA ZONING CLASSIFICATIONS



▼ MAP 5.4 JLUS FOCUS AREA FUTURE LAND USE PLAN DESIGNATIONS



CITIES

As Table 5.2 illustrates, each of the cities participating in the Joint Land Use Study has adopted building codes, zoning and subdivision regulations, and each of the cities, other than Gatesville, has adopted a comprehensive plan. Most of the local zoning ordinances, however, do not expressly prohibit land uses that might be incompatible with Fort Hood operations or which could lead to encroachment on the post's boundaries. The details of the cities existing plans and codes as they address or potentially could address Fort Hood land use compatibility are set forth on the following pages.

CITY OF KILLEEN

Comprehensive Plan

The City of Killeen's 2010 Comprehensive Plan addresses the presence of Fort Hood and its significance in matters related to land use throughout. See e.g., City of Killeen Comprehensive Plan, §§ 1.6, 1.11, 1.13, and 1.16.

Chapter 2 of the plan, which addresses future land use, anticipates future growth to be mostly south of the existing city but expressly recognizes that urban growth is a potential source of encroachment on Fort Hood. Id. at pp. 2.1, 2.11. Chapter 3, "Growth Management and Capacity," notes the importance of continued coordination with Fort Hood on growth issues and calls for adoption of Dark Sky provisions, in part to protect Fort Hood in the City and its extraterritorial jurisdiction. Id. at pp. 3.16, 3.20.

Chapter 3 calls for the preparation of a "Growth Planning Map," which would map 20 years of growth potential and include protection areas associated with Fort Hood. Id. at p. 3.23. Chapter 4, "Mobility," and Chapter 5, "Parks and Recreation," calls for the close coordination of City mobility and parks efforts with Fort Hood, among others, with respect to sharing costs and responsibilities for key infrastructure. Id. at pp. 4.11 and 5.3. Chapter 6, "Housing and Neighborhoods," notes the impact off-post housing was having at the time, id. at p. 6.2, that housing demands and trends in the city essentially paralleled force strength at Fort Hood, id. at p. 6.16, and call for continued coordination with Fort Hood; particularly as to anticipated force strength and changes over time, id. at pp. 6.26, 6.31.

Finally, Table 7.1, "Implementation Strategy for Near Term Action Priorities," highlights those planning actions that implicate Fort Hood-related land use issues and coordination priorities.

Zoning, Subdivision, and Other Regulations

As would be expected, the City of Killeen has adopted code provisions that address land use impacts on and from Fort Hood (see Table 5.2). Table 5.1 illustrates those impact areas that include portions of the City's incorporated and extraterritorial areas, including noise, safety, and protected airspace associated with Gray and Hood Army Airfields, as well as weapons training noise areas. In addition, impacts from City land development near Fort Hood could create potential impacts on the post, including those from outdoor lighting, renewable energy development,

incompatible land uses and expansion of growth-inducing infrastructure.

The City of Killeen has adopted airport hazard area zoning under the authority provided under Chapter 241 of the Tex. Local Gov. Code, as is discussed in the previous section. See City of Killeen Code of Ordinances, Chap 7 (Aviation), Art III (Killeen Municipal Airport Hazard Zoning Ordinance). The Ordinance currently:

1. Restricts heights in the transitional surfaces/zones
2. Includes very general and discretionary "use restrictions"
3. Requires permits and review for certain additional structures and uses
4. Does not reference Fort Hood or military operations.

The City of Killeen's aviation regulations – though providing a useful framework to address Fort Hood's nearby air operations impacts – only address commercial operations at Skylark Field.

However, Killeen's tower regulations do require applicants to show compliance with current FCC and FAA rules and regulations, "… particularly those applicable to civil or military airports, airfields, or heliports" (emphasis added). See City of Killeen Code of Ordinances, Chap 31 (Zoning), Art V (Supplemental Regulations), § 31-609(b). This provision appears, therefore, to protect the airspace associated with Hood Army Airfield and Robert Gray Army Airfield from towers and communications facilities that would interfere with Fort Hood operations.

The City also has an airport zoning commission that oversees development within the airport hazard areas for Skylark Field. Pursuant Tex. Local Gov't Code § 241.014, in 1987, the City established a "joint airport zoning board" (JAZB), for the municipal airport, along with Harker Heights and Bell County. However, on November 10, 2015, just prior to the start of the Joint Land Use Study, the Killeen City Council repealed the ordinance establishing the JAZB and designated the City's planning and zoning commission as the airport zoning commission, per state statute. See City of Killeen Ord. # OR-15-022. The 2015 action by the City Council also limited membership of the zoning board of adjustment to members appointed by the City, removed all references to Bell County and Harker Heights, and defined "Airport" to mean Skylark Field. The newly established airport zoning commission does not regulate lands under the airspace associated with Fort Hood airfields.

Nonetheless, as is shown in Table 5.1, titled "Impacts by Jurisdiction," the transitional surfaces associated with Fort Hood's existing airfields extend over Coryell County, Killeen, Copperas Cove, and Harker Heights. The previous section details the authority of these local governments to reform the existing JAZB to address military air operational impacts and each of the impacted jurisdictions, should they wish to consider doing so.

The City of Killeen also has adopted noise attenuation requirements for structures built within the noise impact areas associated with the municipal airfield. See City of Killeen Building

Code, § 8-340, et seq. Noise attenuation is required within the 65-70 LDN and the greater than 70 LDN Noise Zones identified in the 1991 municipal airport master plan. The land uses subject to noise attenuation requirements are residential (including transient) and public use (including schools, hospitals, and nursing homes). Id. Once again, however, these requirements do not currently apply to the noise impact areas associated with Fort Hood's airfields.

In September 2015, it was announced that the City had been awarded a little more than $1.3 million in grants from the FAA in order to complete an airport master plan study, for engineering associated with replacing passenger boarding bridges, and to acquire wildlife hazard reduction equipment. In addition, the City does include some street lighting in its subdivision regulations. Note that the City's subdivision regulations are distinguishable from the City's zoning and building code provisions related to airports, as the subdivision requirements do encompass military operations at Fort Hood and the zoning and building provisions do not. Finally, the City is currently working on a grant through FAA to acquire land in areas where encroachment is a concern.

The City's extraterritorial jurisdiction is based on Tex. Local Gov't Code § 42.001, et seq., as is detailed in the City's Code, as follows:

> … the City of Killeen and the City of Harker Heights shall have extraterritorial jurisdiction of the areas between such cities as hereinafter provided, to wit:
>
> (1) Harker Heights to have jurisdiction east of Moores Crossing Road, beginning at the intersection of the north right-of-way of the Santa Fe Railroad and the east right-of-way of Moores Crossing Road and extending N 19° 00' east for a distance of one-half mile. Killeen to have jurisdiction of all other territory lying east of Moores Crossing Road and more than one-half mile north of the Santa Fe right-of-way.
>
> (2) Harker Heights to have jurisdiction east of a line from a point on the north right-of-way of FM 2410 (such point being S 19° 00' W from the Southwest corner of the J.J. Tomlinson Survey, Abstract No. 831) and running S 19° 00' W for a distance of one-half mile. Killeen to have jurisdiction to the west of such line for the stated one-half mile and to both west and east of the line projected beyond one-half mile.
>
> (3) Jurisdiction of single owner tracts of less than one hundred sixty (160) acres which are divided for jurisdictional purposes by this agreement will rest with the planning commission in which the major portion of the tract is located.

See City of Killeen Code of Ordinances, §2-3.

Finally, unlike its building and zoning regulations, Killeen's

subdivision regulations do address potential military impacts by requiring "avigation notations" on plats "within the runway protection zone on the latest FAA (Federal Aviation Administration) approved airport layout plan for any airport within the city of Killeen, or any municipal or military airport adjacent to the city of Killeen which have runway protection zones that extend over any part of the city." See City of Killeen Subdivision Code, § 26-29 (emphasis added). In addition, this section requires:

1. a release of the City of impacts created by air operations;
2. limits the heights of structures within FAA airspace (for civil and military operations);
3. plats to indicate any 65 dB noise zones shown on a current "master plan" for "…the worst case noise contour map of either current or future contours for the applicable airport."

COPPERAS COVE

Comprehensive Plan

Copperas Cove's 2007 Comprehensive Plan Update – as would be expected, given its proximity to Fort Hood – also addresses Fort Hood extensively, and notes that growth in the City is both driven and physically limited by the presence of Fort Hood. See 2007 Comprehensive Plan Update, pp. 1.16 and 1.23.

The plan's Future Land Use element recognized in 2007 opportunities to undertake mutually-beneficial land exchanges with Fort Hood. The plan noted that on-post lands northeast of Copperas Cove, were they to be available for an exchange, would help advance some of the City's residential land use objectives, including compact development and affordable housing.

In fact, in July of 2007, the referenced property was brought into the City's jurisdiction and, though some residential uses are still being proposed, the property has so far developed as commercial uses. The following map illustrates roughly the project's status at the time of the Joint Land Use Study.

The City and Fort Hood have continued to explore opportunities to exchange lands that would advance the City's land use objectives and Fort Hood's military mission. At the time of the JLUS, the parties were discussing the possibility of exchanging property along SH 9 and FM 116 N.

As was the case with the City of Killeen, Copperas Cove has recognized the impacts of Fort Hood on its parks and recreation planning. The 2007 plan calls for coordination with Fort Hood in its parks planning efforts and notes that adjustments to park "development standards" are needed, in part, due to the proximity of Fort Hood with "increases the local population of active young adults." See id. at pp. 7.2-7.4.

Within its "Goals and Objectives" chapter, Goals 21 and 24 relate directly to Fort Hood and read as follows:

Goal 21: CONDUCT AND COOPERATE WITH FORT HOOD ON MUTUALLY IMPORTANT ISSUES.

Objectives:

A. Participate in a joint committee involving common issues such as encroachment, infrastructure, and similar projects and programs.

B. Participate in the planning and development of a northeast highway/transportation route connecting F.M. 116 to U.S. Highway 190.

C. Improve access to the regional airport and Stan Schlueter Loop in conjunction with the U.S. Highway 190 Reliever Route.

D. Pursue and participate in activities that support Fort Hood.

E. Participate in Fort Hood forums and similar community leadership programs.

Goal 24: ENHANCE ECONOMIC OPPORTUNITIES WITH FORT HOOD.

Objectives:

A. Maintain opportunities with Fort Hood.

B. Continue liaison efforts with Fort Hood.

See id. at p. 2.7 (see also Economic Development Goal 1, p. 9.9).

In addition, the 2007 Plan Update requires coordination with Fort Hood officials on thoroughfare planning and road alignments (including for Tank Destroyer Blvd. Connection/Extension) and other public services. See id. at pp. 3.30 and 8.13. Additionally, the plan calls for establishing street lighting standards, which, at the time of the Joint Land Use Study, had not yet been adopted. Finally, the City's Annexation and Growth Management Assessment element provides that services should be extended into the ETJ only in "limited, specific circumstances," and it does not support "the establishment of special or municipal utility districts." See id. at p. 10.15.

The Copperas Cove Comprehensive Plan is currently being updated and is expected to be completed later in 2017.

Zoning, Subdivision, and Other Regulations

As is indicated in Table 5.2, the Copperas Cove code provisions do not currently address many land use impacts associated with Fort Hood. The City currently has a two-mile extraterritorial jurisdiction.

As Table 5.1 shows, however, there are some impact areas that encompass portions of the City's incorporated and extraterritorial areas, including protected airspace associated with Robert Gray Army Airfield and weapons training noise zones. In addition, impacts from land development within Copperas Cove could create potential impacts on Fort Hood, including from outdoor lighting, renewable energy development, incompatible land uses, and the expansion of significant growth-inducing infrastructure.

While not directly related to Fort Hood, City sign lighting regulations do require billboards and off-premises spotlights to be shielded "such that their light source cannot be seen from abutting roads or properties." See City of Copperas Cove Sign Regulations, § 16.5-8(f)(5). In addition, lighting must be shielded to remain on the premises being approved for development for multi-family residential, see id. at § 20-17(a)(6)(e), business/professional uses, see id. at § 20-19(9), industrial land uses, id. at § 20-21(h), and swimming pools, id. at § 20-26(2). No Dark Sky ordinance, which would go further towards protecting Fort Hood's night training activities, was being prepared as of the date of the JLUS.

Finally, Copperas Cove's municipal ordinances also include a number of "non-land use" code provisions supportive of military personnel (past and current); for example, waiving water and sewer deposits and giving credit for military service in the city's retirement system.

CITY OF HARKER HEIGHTS

Comprehensive Plan

As is shown in Table 5.2, the City of Harker Heights has an adopted comprehensive plan: the "City of Harker Heights Comprehensive Plan 2007." The plan includes background information related to Fort Hood and its relevance to land use issues in the City. For example, the plan notes that Fort Hood is a primary economic driver for the City and has a major impact on the City's population, growth, and demographics. See City of Harker Heights Comprehensive Plan 2007, pp. 12, 25, 26, 43.

While the plan does not call for land use compatibility measures directly, it does encourage the use of shielding requirements for site development activities and an awareness of the impacts of lighting on community character in general. See id., pp. 45, 46.

The plan was in the process of being updated during the preparation of the Joint Land Use Study.

Zoning, Subdivision, and Other Regulations

Harker Heights code provisions do not include many directly related to land use issues associated with Fort Hood. This is not surprising, necessarily, since, as Table 1 indicates, major impacts from Fort Hood do not fall within the City. However, City developments could create potential impacts on Fort Hood from unshielded outdoor lighting, renewable energy development, incompatible land uses, and expansion of significant growth-inducing infrastructure. In addition, the airspace associated with Hood Army Airfield does cover a portion of Harker Heights such that development within the City under these areas could intrude into that airspace if not monitored to be avoided.

To that end, the City does regulate communication tower heights and locations and had been a member of the "Killeen/Harker Heights, Bell County Joint Airport Zoning Board," which included airspace associated only with the former municipal airport, now the Skylark airfield. However, as noted above, the City of Killeen repealed the ordinance creating the JAZB in 2015. Nonetheless, the City's "Broadcasting and Telecommunications Towers" code provisions limit the height of all communications

towers to 150 feet, without a variance from the City's Planning and Zoning Commission. See City of Harker Heights Code of Ordinances, § 157.11.

The City does have minimum lighting trespass standards in its zoning code. See, e.g., §§ 155.030 and 155.060 (requiring lighting, to the maximum extent possible, to be "arranged as to be reflected away from property zoned or used for residential purposes"). The code does not include more extensive dark sky provisions at this time.

Finally, except to the extent it conflicts with another city's jurisdiction, Harker Height's extraterritorial jurisdiction extends two miles from the incorporated limits of the City.

CITY OF NOLANVILLE

Comprehensive Plan

Nolanville has adopted a comprehensive plan (the "Nolanville Comprehensive Plan 2015-2030"), which includes some background information related to Fort Hood in that community. As with the other similarly-situated jurisdictions participating in the Joint Land Use Study, Nolanville's plan recognizes the economic, demographic, and cultural influence of the post. See e.g., Nolanville Comprehensive Plan 2015-2030, p. 9. The plan notes that many who work or are stationed at Fort Hood commute there from their homes in the Nolanville. See id. at p. 22. As was the case with the comprehensive plans for Killeen and Copperas Cove, the City of Nolanville's plan recognizes the demands and opportunities for park facilities due to the presence of Fort Hood personnel. Id. at 23. Finally, Goal 6 of the plan calls for new street lighting downtown and a reduction of "light trespass" in this regard.

Zoning, Subdivision, and Other Regulations

As Table 5.1 illustrates, no designated impact areas associated with Fort Hood air operations or weapons training activities fall within the city limits or extraterritorial jurisdiction of Nolanville, which extends 1.5 miles. Therefore, the City's codes do not address impacts from Fort Hood that could impact future development.

However, as is shown in Table 5.1, if unregulated completely, land development within the City or it's ETJ could negatively impact Fort Hood training capabilities, including outdoor lighting, renewable energy development, or significant growth-inducing infrastructure that may encourage incompatible or high-density growth patterns in the vicinity of Fort Hood.

Nolanville's zoning code does restrict the placement of wind energy conversion units that would conflict with military navigational operations (see City of Nolanville Zoning Ordinance, Art. V, Div. 10), and includes the following requirements:

1. Prohibits wind energy units from interfering with "Military or civil navigational or defense radar signals" (id. at § 620.3(b)(1)(C)).
2. Prohibits wind energy units in areas "deemed critical as

navigational and defense radar sensitive areas by any military facility or installation." (id. at § 620.3(b)(2)).

3. Requires coordination with federal, state, and military agencies and compliance with federal state, and military requirements (e.g., see id. at §§ 620.4 (e), (j) & (k)).

In addition, the City's supplementary district regulations include limitations on outdoor lighting, including defining any outdoor lighting fixtures above 600 lumens that are "not shielded so that the luminous elements of the fixtures are visible from any other property" as an "outdoor lighting nuisance." See id. at § 201.1(c). Though not of a magnitude necessary to address citywide "dark sky" concerns for Fort Hood, the City's zoning code does include significant site development lighting restrictions. Id. at § 540.1, et seq.

CITY OF TEMPLE

Comprehensive Plan

Temple's comprehensive plan notes the significance of Fort Hood's influence on the City and how its housing and economic conditions are tied closely to Fort Hood. See Choices '08: City of Temple Comprehensive Plan 2008-2030. In fact, the City's estimate at the time that its population would reach 90,000 by 2030, were based in part on the significant and continued presence of Fort Hood, "from which Temple attracts military families seeking affordable housing, good schools, and jobs for spouses, as well as veterans drawn by the Teague Center and associated medical complex." Id. at p. 2-8. As the other communities' plans reasonably noted, Temple's plan documents the influence Fort Hood's relative force strength has on its housing market. Id. at p. 6-21. Specifically, the plan notes that the City's rental market has been stable, in part, due to the alternating deployments of two divisions at the post at that time.

Zoning, Subdivision, and Other Regulations

As Table 5.1 illustrates, no designated impact areas associated with Fort Hood air operations fall within Temple's city limits or its extraterritorial jurisdiction, which extends 3.5 miles. On the other hand, the noise contours for large caliber weapons training are present in a portion of Temple's ETJ. However, the City's codes do not address impacts from Fort Hood that could impact future development, nor those impacts from development that could impact Fort Hood. As Table 5.1 shows, outdoor lighting, renewable energy development, or major growth inducing infrastructure in the City or its ETJ could negatively impact Fort Hood training.

Current code provisions do address outdoor lighting to some extent. See e.g. City of Temple Unified Development Code, § 3.4.2 (C) (including outdoor lighting requirements as approval criteria for Planned Developments). In addition, nonresidential developments in mixed-use districts are required to orient outdoor lighting away from residential properties. Id. at § 6.2.4(C). Requirements related to outdoor lighting in the I-35 Corridor Overlay Zone illustrate further the City's commitment to reasonable lighting standards. These include restrictions on light

trespass, intensity, directional control, sign lighting, temporary lighting, and all-night lighting. Id. at § 6.7.5(K). No additional "dark sky" standards had been adopted by the City of Temple at the time of the Joint Land Use Study.

Finally, the City of Temple is a member of a joint airport zoning board overseeing operations at the Draughon-Miller Central Texas Regional Airport (DMCTRA). Formerly known as the Temple Army Airfield, DMCTRA is located on Highway 36, about 5.5 miles west of Temple. In addition to the City of Temple, representatives are appointed to this JAZB from Bell County as well. Notably, the city code provisions governing the Draughon-Miller JAZB addresses on-site airport operations and does not include "airport hazard areas" or "controlled compatible land use areas" as authorized by Chapter 241 of the Texas Local Gov't Code.

CITY OF BELTON

Comprehensive Plan

The City of Belton is currently updating its Comprehensive Plan and is expected to be completed by the end of 2016.

Zoning, Subdivision, and Other Regulations

Similar to other cities participating in the JLUS that are more distant from Fort Hood, Belton has not adopted land use restrictions or coordination requirements related to the post into its zoning, subdivision, or other code provisions. It has included some outdoor lighting standards in Section 39 of its zoning code, however. See Comprehensive Zoning Ordinance City of Belton, Ord. No. 22790-1, "Lighting and Glare Standards." Section 39.2, for example, prohibits off-site glare "directed across any boundary property line above a height of three feet (3')." Lighting associated with residential land uses is limited, at the property line, to 0.25 foot candles. Id. at § 39.2. Notably, light sources must be of a "down-light type, indirect, diffused, or shielded-type luminaries" or otherwise installed to reduce glare or to interfere with the use of adjacent properties. Id. at § 39.4. No further "dark sky" type provisions have been adopted in Belton at this time.

Per state statute, Belton's extraterritorial jurisdiction is one-mile from its corporate boundaries.

CITY OF GATESVILLE

Zoning, Subdivision, and Other Regulations

The "City of Gatesville Progressive Zoning Ordinance" was adopted by the City Council in 1995. The City also has provisions in the City Code of Ordinances related to the Gatesville Municipal Airport (see City of Gatesville Code of Ordinances, Chapter 4, "Aviation") and subdivision regulations (see id., Chapter 22, "Adopting Model Subdivision Rules"). The provisions in these code sections do not address activities at Fort Hood at this time.

However, as shown in Table 5.1, some impact areas associated with large caliber weapons training do fall within Gatesville's city limits and its 1-mile extraterritorial jurisdiction. In addition,

incompatible land development activities on these land could impact Fort Hood training areas, including unregulated outdoor lighting, renewable energy developments, and growth-inducing infrastructure that would encourage development near post boundaries.

5.6 CIVIC/BUSINESS INTERESTS

It is important to note that, in addition to the "land use" related programs the local governments have put into place, numerous military-related support programs also have been created by the local government, local chambers of commerce, and other non-governmental agencies. For example, The Belton Area Military Spouses Support has been formed, initially through the Chamber, to provide a network for military spouses. In addition, a Fort Hood "adopt-a-school program" has been active over 7 years.

The following Chamber of Commerce subcommittees already are in place and either currently address Ft. Hood issues directly or might do so as part of the recommendations in this Joint Land Use Study.

1. Belton Area Chamber of Commerce – Military Relations Committee
2. Copperas Cove Chamber of Commerce and Visitors Center – Military Affairs Committee
3. Gatesville Chamber of Commerce – Does not have separate a military affairs committee
4. Greater Killeen Chamber of Commerce – Military Relations Council
5. Harker Heights Chamber of Commerce – Military Affairs Committee
6. Temple Chamber of Commerce – Military Affairs Council.

RECOMMENDATIONS
SECTION SIX

RECOMMENDATIONS

This section provides recommendations that, if implemented, will help to ensure the long-term sustainability of the operational, testing and training mission at Fort Hood as the region's communities continue to grow and prosper.

6.1 OVERVIEW

In order to achieve the goals established at the beginning of the Joint Land Use Study process, a comprehensive list of recommendations was prepared for the consideration of, and voluntary implementation by, local governments in the region. Each community will determine how it will move forward with the study's recommendations based on their particular needs and local compatibility factors. In support of the recommendations, Section 6.3 outlines an implementation plan with community-specific strategies to provide guidance on how the recommendations can be implemented by the study partners.

As indicated throughout the JLUS report, at the present time there are limited encroachment concerns arising from incompatible civilian development as it relates to Fort Hood's operational, testing and training mission. From the perspective of the installation and its mission as a whole, development has not encroached into areas in a manner or to a degree that places any significant impediments on military training activities. The emphasis of this study, however, is on the extent of training impacts that are present on and around the installation as they exist at the current time. The areas of specific concern identified in the study are limited by the known extent of the current training impacts that can be quantified and mapped. Changes in mission posture, weapons systems, training tempo, deployed strength, alterations to ranges and a host of other factors can cause the areas where encroachment from civilian development poses a concern for training to expand, contract and shift around the installation, or even do all three simultaneously. As such, it should be anticipated and expected that changes will occur that will both change the spatial location and type of encroachment concerns that the study partners may have to address in the future.

6.2 RECOMMENDATIONS

A broad range of recommendations were developed for consideration by local governments in the region. The recommendations were organized into four categories as outlined below.

- Regional coordination in support of compatible growth
- Planning for compatible growth
- Regulations to support compatible growth strategies
- Supplemental strategies

REGIONAL COORDINATION IN SUPPORT OF COMPATIBLE GROWTH

The communities in the Fort Hood region have maintained strong relationships between each other and with Fort Hood. The Joint Land Use Study process has identified a need for these ongoing relationships to be strengthened with a more formalized framework to facilitate focused communication between local governments and Fort Hood on encroachment issues, regional development patterns, future land use and other related matters. At the big picture, policy level, the region communicates well and has been successful in responding to situations that warrant regional coordination and cooperation, such as past BRAC rounds. However, at the technical level and community level, many of those connections and lines of communication may benefit from a more defined and formalized structure. An official framework would provide for clear communication throughout the region from a policy, technical and community standpoint, enhancing the region's ability to effectively sustain the operational, testing and training mission at Fort Hood. A formalized framework for regional cooperation would also serve as the venue for implementing the full set of strategies recommended by the JLUS across jurisdictional boundaries in a coordinated manner.

REGIONAL COORDINATION RECOMMENDATIONS

RC1 - Develop a formalized and unified approach to enhance communication and land use coordination between Fort Hood and local governments in the region.

RC2 - Designate a regional organization to facilitate the ongoing implementation of a regional approach to enhanced communication and land use coordination between Fort Hood and local governments.

RC3 - Prepare and adopt a Memorandum of Understanding / Agreement (MOU or MOA) between Fort Hood, local governments, and other key stakeholders, establishing a formalized framework for coordination and communication.

RC4 - Establish an "encroachment awareness area" around Fort Hood and monitor land use changes, development proposals, zoning changes, and infrastructure projects within the area to identify potential threats to the long term sustainability of Fort Hood's training mission.

RC5 - Building on previous coordination efforts with Coryell County, establish a formalized process for the intermittent closure of public roads for airborne operations or other training activities that may necessitate such closures for safety reasons.

RC6 - Establish and maintain a regional GIS database for monitoring land use changes and development patterns around Fort Hood and evaluating land use proposals for consistency with regional compatible growth goals.

RC7 - Regularly monitor ERCOT's application database for alternative energy project siting, as well as other tall structures, in the Western Training area and areas around Fort Hood. Develop a standard operating procedure for a regional response to applications that may impact Fort Hood's aviation training mission.

RC8 - Conduct outreach efforts and establish formal relationships with all county and municipal governments in the Western Training Area to facilitate the communication of concerns about potential wind energy projects that may affect aviation training.

RC9 - Local governments and Fort Hood should work together on a regional basis to make information available to the public regarding the location of noise, safety zones and other areas of civilian development encroachment concern related to Fort Hood's operational, testing, and training mission.

RC10 - Utilize the regional coordination organization as a clearinghouse for information on planned state and local infrastructure projects to ensure that Fort Hood is notified prior to the initiation of projects that may induce incompatible growth in areas of encroachment concern.

PLANNING FOR COMPATIBLE GROWTH

At the local and regional level, the opportunity exists to adopt plans and policies to help protect the Fort Hood operational, testing and training mission, by encouraging civilian development patterns adjacent to the installation that are compatible. The recommendations discussed below provide policy guidance to the local governments for their consideration.

PLANNING RECOMMENDATIONS

PCG1 - Local governments should consider the adoption of amendments to their Comprehensive Plans that support and ensure consistency with the findings and recommendations of the Joint Land Use Study.

PCG2 - Integrate local governments into Fort Hood's Operational Noise Management Plan development process and ensure prompt dissemination of the study document and associated data to affected local governments whenever the plan is updated.

PCG3 - For compatibility planning purposes, establish the extent of the imaginary approach and departure surfaces for the Longhorn and Shorthorn Auxiliary Landing Strips to prepare for a potential future mission change or designation as Class A or B airfields. Once established, include this data in local comprehensive plan documents.

PCG4 - Prepare a noise study for the proposed second runway at Robert Gray AAF based on the most likely scenarios for aircraft mix and operational tempo. Once finalized, integrate the results

of the study into the comprehensive plans of affected local governments.

PCG5 - Prepare noise studies for Longhorn and Shorthorn Auxiliary Landing Strips during the next update of the Fort Hood Operational Noise Management Plan. Once finalized, integrate the results of the studies into the comprehensive plans of local governments.

PCG6 - For compatibility planning purposes, establish the extent of the accident potential zones for the Longhorn and Shorthorn Auxiliary Landing Strips to prepare for a potential future mission change or designation as Class A or B airfields. Once established, include this data in local comprehensive plan documents.

PCG7 - Integrate the established ACUB priority areas into applicable local government plans (comprehensive plans, water and sewer master plans, annexation plans, etc.) to ensure that local plans are consistent with ACUB priorities.

PCG8 - Prepare a small area plan for the portion of the City of Killeen that is adjacent to Hood Army Airfield that is focused on identifying opportunities and options for enhancing the compatibility of development in this area with aviation operations at Hood AAF.

REGULATIONS TO SUPPORT COMPATIBLE GROWTH STRATEGIES

The Joint Land Use Study identified existing and potential regulatory tools to help implement the goals of the study. The recommendations below provide an array of options and potential tools that are available or may become available in the future for local government consideration.

REGULATORY RECOMMENDATIONS

RS1 - As applicable, the participating local governments should consider the adoption of zoning, subdivision and building code amendments in support of the Joint Land Use Study findings and recommendations concerning aviation noise, accident potential zones, ad hazards to aerial navigation to encourage compatibility related to air operations, testing and training at Fort Hood.

RS2 - As applicable, the participating local governments should consider adoption of zoning, subdivision and building code amendments in support of the Joint Land Use Study findings and recommendations concerning weapons noise to encourage land use compatibility with weapons testing and training at Fort Hood.

RS3 - Seek legislative approval for the extension of military related compatible use regulations into city extraterritorial jurisdictions (ETJs) and/or unincorporated portions of counties within a distance of Fort Hood that is reasonably necessary to ensure the ability of local governments to promote compatible growth

around the installation. Once authority has been granted, jurisdictions that currently lack such authority should consider adopting regulations to promote compatible growth.

RS4 - Adopt regulations requiring the placement of a notation on subdivision plats indicating the likelihood of impacts from military training activities within areas of both defined and potential encroachment concern around the installation.

RS5 - Consider extending the application of noise based compatible use regulations, particularly limitations on the density of residential development, beyond the current known extent of the impacts to account for the likelihood of future changes in the extent of such impacts.

RS6 - Establish policies for the application of compatible use requirements for properties in areas of encroachment concern when public utility service is requested, but which are not annexed by the local government extending utility services.

RS7 - Utilize Development Agreements in city extraterritorial jurisdiction to encourage compatible development practices when annexation is not feasible or will be delayed until a future date.

RS8 - Seek legislative action to strengthen local government authority with respect to the approval of Municipal Utility Districts within areas where encroachment by civilian development around Fort Hood may pose compatibility issues.

RS9 - Work with the real estate industry to establish a requirement for the disclosure of potential military impacts in real estate disclosure forms or at some other appropriate point in the real estate transaction process.

RS10 - Prepare and adopt dark-sky compatible outdoor lighting regulations throughout the region.

RS11 - Coordinate the preparation of compatible growth regulations to ensure that local governments are adopting similar regulations for similar impacts, with a goal of discouraging "jurisdiction shopping" by potential developers and promote a consistent approach to regulation in the region.

SUPPLEMENTAL STRATEGIES

While land use compatibility was the focus of the Joint Land Use Study, other related factors exist that contribute to the growth of the region and influence the future of the region's communities and the sustainability of Fort Hood. The recommendations below provide some guidance on topics that arose during the course of the JLUS process which can help to further regional compatible growth objectives, but which may not fit neatly into the framework of the preceding categories.

ADDITIONAL RECOMMENDATIONS

S1 - Establish a working group comprised of local government, military and industry representatives to study the feasibility of developing geothermal energy resources on and around Fort Hood.

S2 - Study the feasibility of developing a joint civilian/military use multi-modal truck/rail cargo transfer facility on Fort Hood that could support both economic development interests and Fort Hood's logistics requirements.

S3 - Consider the establishment of a regionally administered program for the acquisition of critical lands subject to incompatible civilian encroachment and/or to facilitate land swaps to supplement the ACUB program.

S4 - Establish a working group comprised of local government, military and industry representatives to study the feasibility of developing the proposed Coryell County Off-Channel Reservoir (OCR) located along the western boundary of the installation adjacent to Cowhouse Creek, potentially providing water for projected future shortages in the region.

S5 - Continue to support regional efforts to maintain compliance with EPA ozone and air quality standards.

6.3 IMPLEMENTATION STRATEGIES

Implementation strategies with both regional and community-specific actions were developed as a means to provide direct guidance on how the recommendations can be implemented by the study partners. The recommendations outlined in Section 6.2 are compiled into an implementation matrix in this section to be used as a quick and easy reference for local government officials, state and federal partners, and other parties involved in the implementation of the Joint Land Use Study. The implementation matrix identifies priorities, resources, time frames and responsible parties for each implementation strategy, to help stakeholders understand the most effective approach to implementing the strategies.

The following are descriptions of each of the categories:

Recommendation Category – The major category was derived through the research of current conditions and input from stakeholders. They provide the overall context for the basis of the recommendations.

Recommendations – The recommendations are more specific strategies categorized according to the key area it supports.

Time frame – Represents the time frame in which each action step should be addressed. Generally, shorter time frames infer a higher priority. Time frames are indicated in the matrix as short-

term, mid-term, or long-term. Below is a description of each time frame.

- Short-term - should be completed in the first 12 months
- Mid-term - should be achieved in 1 to 3 years
- Long-term - should be achieved in 3 to 5 years

Resources – Resources are primarily related to monetary cost to complete the implementation strategies. The tables uses the "$" symbol to represent monetary ranges. Actual resources could cost more or less depending on the assistance or consultant selected. The ranges are as follows:

- $ - Less than $10,000
- $$ - $10,000-$50,000
- $$$ - $50,000-$100,000
- $$$$ - More than $100,000
- Policy – Not outside of normal annual budget expenditures

Partners – This category identifies partners associated with the Fort Hood region that play a key role in implementing each recommendation. This category also includes the Office of Economic Adjustment, the State of Texas and the inclusion of a consultant or other outside party that may be necessary to help implement and achieve certain recommendations. The partner abbreviations utilized in the plan matrix are as follows:

- LG = Local Government
- FH = Fort Hood
- RO = Regional Organization
- OEA = Office of Economic Adjustment (Technical Assistance and Funding Resource)
- TX = State of Texas

Priority – Due to the limited resources that are faced by all levels of government, priorities are identified for each strategy to help guide the region towards the most critical strategies. Priorities are indicated as high, medium, or low, with high being the most pressing or urgent. All recommendations that were described as "high" priority should be addressed by the region before recommendations described as "medium" or "low" priority. However, as time and resources allow, there may be cases where actions that have a "low" priority may be moved to a higher level of priority.

1. REGIONAL COORDINATION IN SUPPORT OF COMPATIBLE GROWTH					
#	Recommendation	Time frame	Resources	Partners	Priority
RC1	Develop a formalized and unified approach to enhance communication and land use coordination between Fort Hood and local governments in the region.	Short-term	$	LG, RO, FH, OEA	High
RC2	Designate a regional organization to facilitate the ongoing implementation of a regional approach to enhanced communication and land use coordination between Fort Hood and local governments.	Short-term	$	LG, OEA	High
RC3	Prepare and adopt a Memorandum of Understanding/Agreement (MOU or MOA) between Fort Hood, local governments, and other key stakeholders, establishing a formalized framework for coordination and communication.	Mid-term	$	RO, LG, FH, OEA	Low
RC4	Establish an "encroachment awareness area" around Fort Hood and monitor land use changes, development proposals, zoning changes, and infrastructure projects within the area to identify potential threats to the long term sustainability of Fort Hood's training mission.	Mid-term	$	RO	Med.
RC5	Building on previous coordination efforts with Coryell County, establish a formalized process for the intermittent closure of public roads for airborne operations or other training activities that may necessitate such closures for safety reasons.	Mid-term	$	RO, LG, FH	Low

1. REGIONAL COORDINATION IN SUPPORT OF COMPATIBLE GROWTH (CONTINUED)					
#	Recommendation	Time frame	Resources	Partners	Priority
RC6	Establish and maintain a regional GIS database for monitoring land use changes and development patterns around Fort Hood and evaluating land use proposals for consistency with regional compatible growth goals.	Mid-term	$$	RO, OEA	Med.
RC7	Regularly monitor ERCOT's application database for alternative energy project siting, as well as other tall structures, in the Western Training area and areas around Fort Hood. Develop a standard operating procedure for a regional response to applications that may impact Fort Hood's aviation training mission.	Short-term	$	RO, FH, TX	High
RC8	Conduct outreach efforts and establish formal relationships with all county and municipal governments in the Western Training Area to facilitate the communication of concerns about potential wind energy projects that may affect aviation training.	Short-term	$	RO, FH	Low
RC9	Local governments and Fort Hood should work together on a regional basis to make information available to the public regarding the location of noise, safety zones and other areas of civilian development encroachment concern related to Fort Hood's operational, testing, and training mission.	Mid-term	$	RO, LG, FH, OEA	Med
RC10	Utilize the regional coordination organization as a clearinghouse for information on planned state and local infrastructure projects to ensure that Fort Hood is notified prior to the initiation of projects that may induce incompatible growth in areas of encroachment concern.	Mid-term	$	RO, LG, FH	High

2. PLANNING FOR COMPATIBLE GROWTH					
#	Recommendation	Time frame	Resources	Partners	Priority
PCG1	Local governments should consider the adoption of amendments to their Comprehensive Plans that support and ensure consistency with the findings and recommendations of the Joint Land Use Study.	Mid-term	$$	LG, OEA	Med.
PCG2	Integrate local governments into Fort Hood's Operational Noise Management Plan development process and ensure prompt dissemination of the study document and associated data to affected local governments whenever the plan is updated.	Long-term	$	FH, LG, RO	Med.
PCG3	For compatibility planning purposes, establish the extent of the imaginary approach and departure surfaces for the Longhorn and Shorthorn Auxiliary Landing Strips to prepare for a potential future mission change or designation as Class A or B airfields. Once established, include this data in local comprehensive plan documents.	Long-term	$$	FH, LG, RO	Low
PCG4	Prepare a noise study for the proposed second runway at Robert Gray AAF based on the most likely scenarios for aircraft mix and operational tempo. Once finalized, integrate the results of the study into the comprehensive plans of affected local governments.	Mid-term	$$	FH, LG, RO	Med.
PCG5	Prepare noise studies for Longhorn and Shorthorn Auxiliary Landing Strips during the next update of the Fort Hood Operational Noise Management Plan. Once finalized, integrate the results of the studies into the comprehensive plans of local governments.	Long-term	$$	FH, LG, RO	Low

2. PLANNING FOR COMPATIBLE GROWTH (CONTINUED)					
#	Recommendation	Time frame	Resources	Partners	Priority
PCG6	For compatibility planning purposes, establish the extent of the accident potential zones for the Longhorn and Shorthorn Auxiliary Landing Strips to prepare for a potential future mission change or designation as Class A or B airfields. Once established, include this data in local comprehensive plan documents.	Long-term	$$	FH, LG, RO	Low
PCG7	Integrate the established ACUB priority areas into applicable local government plans (comprehensive plans, water and sewer master plans, annexation plans, etc.) to ensure that local plans are consistent with ACUB priorities.	Mid-term	$$	FH, LG, RO	High
PCG8	Prepare a small area plan for the portion of the City of Killeen that is adjacent to Hood Army Airfield that is focused on identifying opportunities and options for enhancing the compatibility of development in this area with aviation operations at Hood AAF.	Mid-term	$$$	LG, RO, FH	Med.

3. REGULATIONS TO SUPPORT COMPATIBLE GROWTH STRATEGIES					
#	Recommendation	Time frame	Resources	Partners	Priority
RS1	As applicable, the participating local governments should consider the adoption of zoning, subdivision and building code amendments in support of the Joint Land Use Study findings and recommendations concerning aviation noise, accident potential zones, ad hazards to aerial navigation to encourage compatibility related to air operations, testing and training at Fort Hood.	Long-term	$$	LG, RO, OEA	Med.
RS2	As applicable, the participating local governments should consider adoption of zoning, subdivision and building code amendments in support of the Joint Land Use Study findings and recommendations concerning weapons noise to encourage land use compatibility with weapons testing and training at Fort Hood.	Long-term	$$	LG, RO, OEA	Med.
RS3	Seek legislative approval for the extension of military related compatible use regulations into city extraterritorial jurisdictions (ETJs) and/or unincorporated portions of counties within a distance of Fort Hood that is reasonably necessary to ensure the ability of local governments to promote compatible growth around the installation. Once authority has been granted, local governments should consider adopting regulations in areas where the authority is granted to do so.	Long-term	$$	RO, LG, TX	High
RS4	Adopt regulations requiring the placement of a notation on subdivision plats indicating the likelihood of impacts from military training activities within areas of both defined and potential encroachment concern around the installation.	Mid-term	$	RO, LG	Med.

3. REGULATIONS TO SUPPORT COMPATIBLE GROWTH STRATEGIES (CONTINUED)					
#	Recommendation	Time frame	Resources	Partners	Priority
RS5	Consider extending the application of noise based compatible use regulations, particularly limitations on the density of residential development, beyond the current known extent of the impacts to account for the likelihood of future changes in the extent of such impacts.	Long-term	$	RO, LG, OEA	High
RS6	Establish policies for the application of compatible use requirements for properties in areas of encroachment concern when public utility service is requested, but which are not annexed by the local government extending utility services.	Long-term	$$	RO, LG	Med.
RS7	Utilize Development Agreements in city extraterritorial jurisdiction to encourage compatible development practices when annexation is not feasible or will be delayed until a future date.	Mid-term	$	RO, LG	Med.
RS8	Seek legislative action to strengthen local government authority with respect to the approval of Municipal Utility Districts within areas where encroachment by civilian development around Fort Hood may pose compatibility issues.	Long-term	$$	RO, LG, TX	High
RS9	Work with the real estate industry to establish a requirement for the disclosure of potential military impacts on real estate disclosure forms or at some other appropriate point in the real estate transaction process.	Mid-term	$	RO, LG, TX	Low
RS10	Prepare and adopt dark-sky compatible outdoor lighting regulations throughout the region.	Long-term	$	RO, LG, OEA	Low
RS11	Coordinate the preparation of compatible growth regulations to ensure that local governments are adopting similar regulations for similar impacts, with a goal of discouraging "jurisdiction shopping" by potential developers and promote a consistent approach to regulation in the region.	Long-term	$	RO, LG, OEA	High

4. SUPPLEMENTAL STRATEGIES					
#	Recommendation	Time frame	Resources	Partners	Priority
S1	Establish a working group comprised of local government, military and industry representatives to study the feasibility of developing geothermal energy resources on and around Fort Hood.	Long-term	$	RO, FH, TX	Med.
S2	Study the feasibility of developing a joint civilian/military use multi-modal truck/rail cargo transfer facility on Fort Hood that could support both economic development interests and Fort Hood's logistics requirements.	Mid-term	$$$	RO, FH, TX	Low
S3	Consider the establishment of a regionally administered program for the acquisition of critical lands subject to incompatible civilian encroachment and/or to facilitate land swaps to supplement the ACUB program.	Long-term	$$$$	RO, LG, TX	Med.
S4	Establish a working group comprised of local government, military and industry representatives to study the feasibility of developing the proposed Coryell County Off-Channel Reservoir (OCR) located along the western boundary of the installation adjacent to Cowhouse Creek, potentially providing water for projected future shortages in the region.	Long-term	$	RO, TX	Low
S5	Continue to support regional efforts to maintain compliance with EPA ozone and air quality standards.	Short-term	$	RO, LG, FH, TX	High

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